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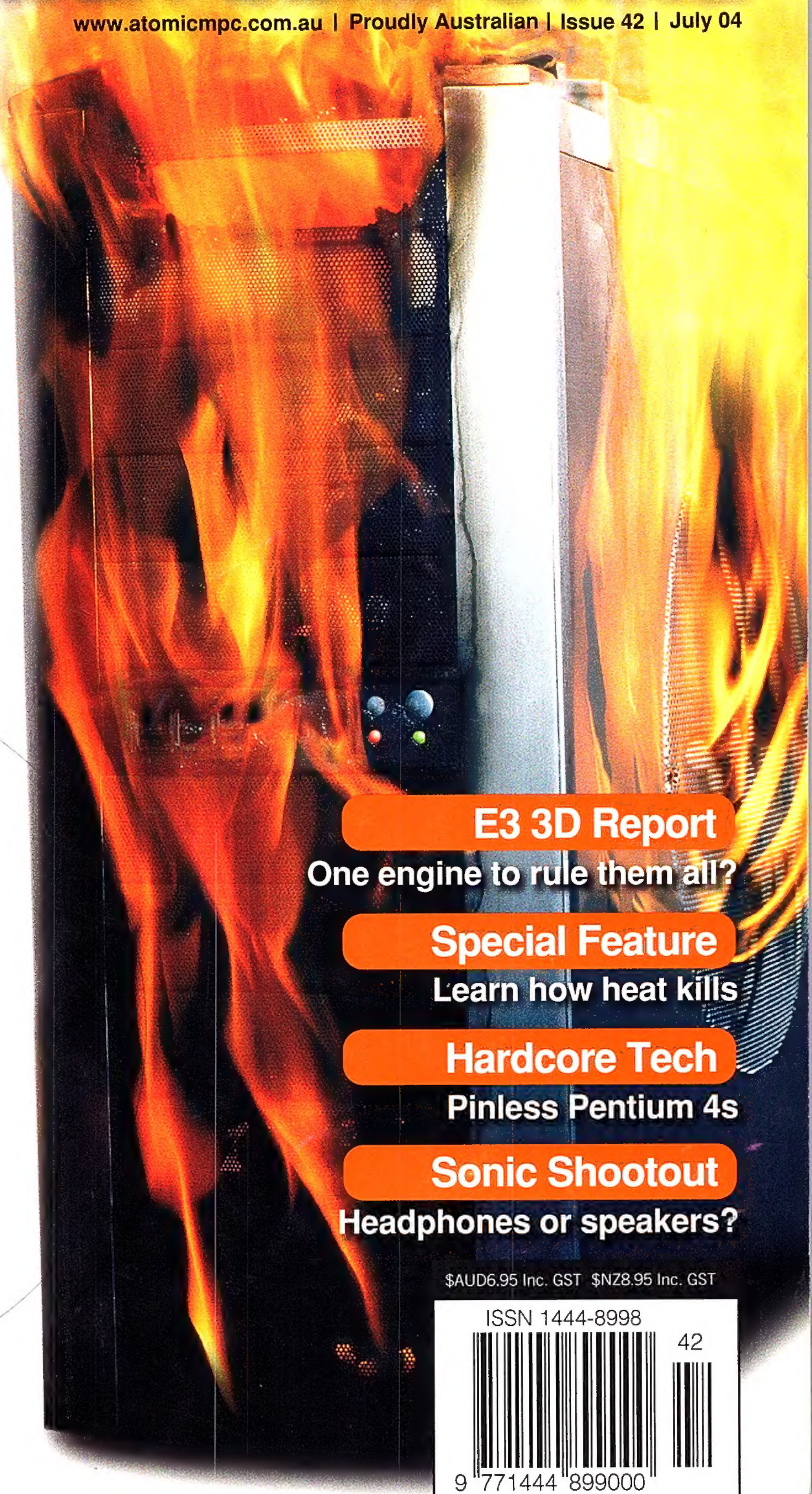

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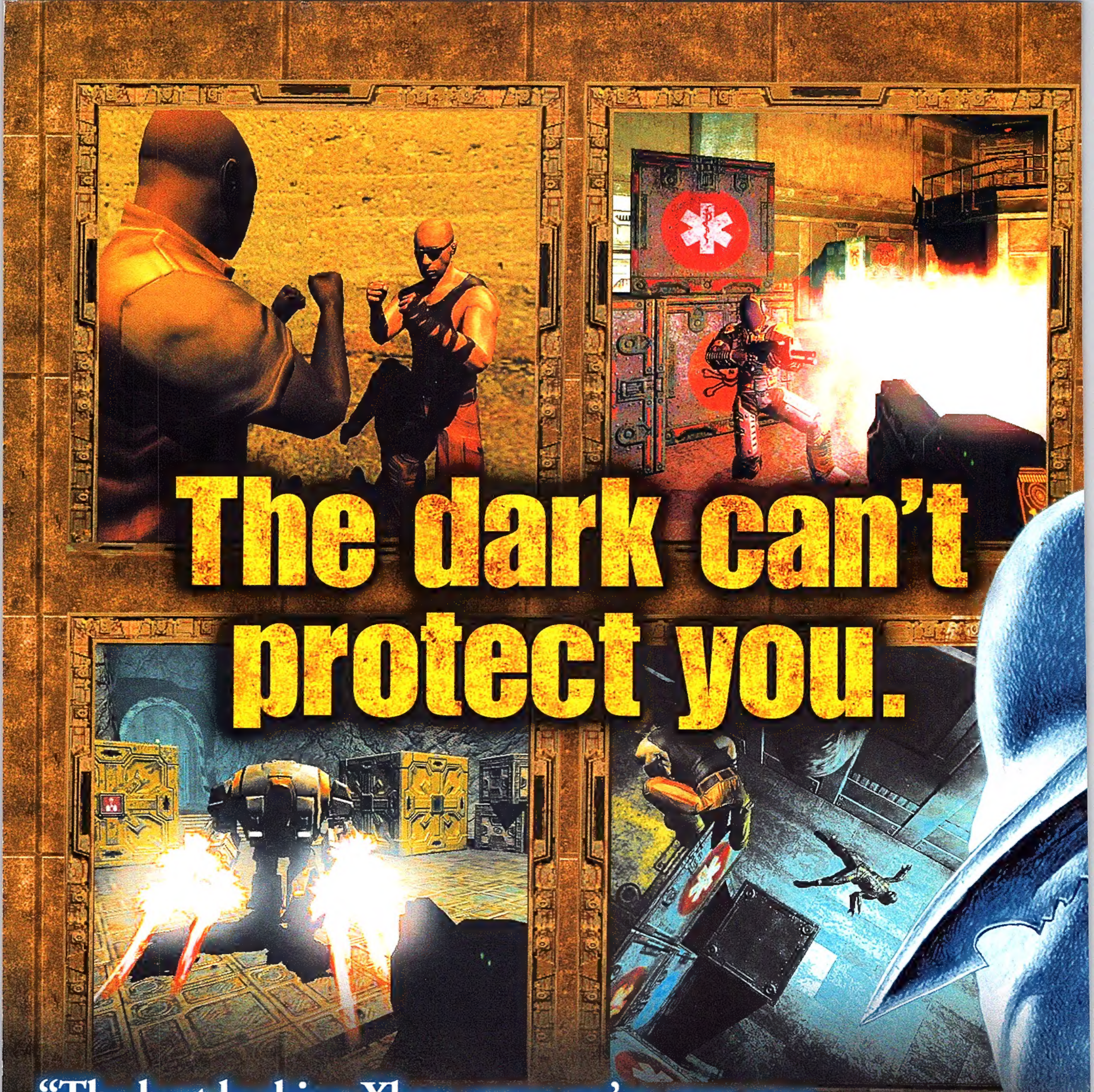

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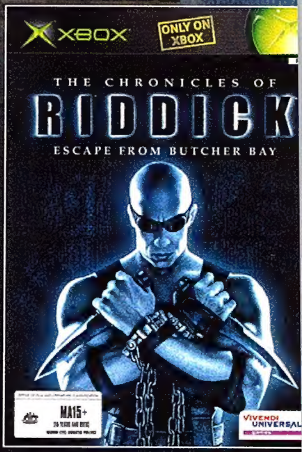

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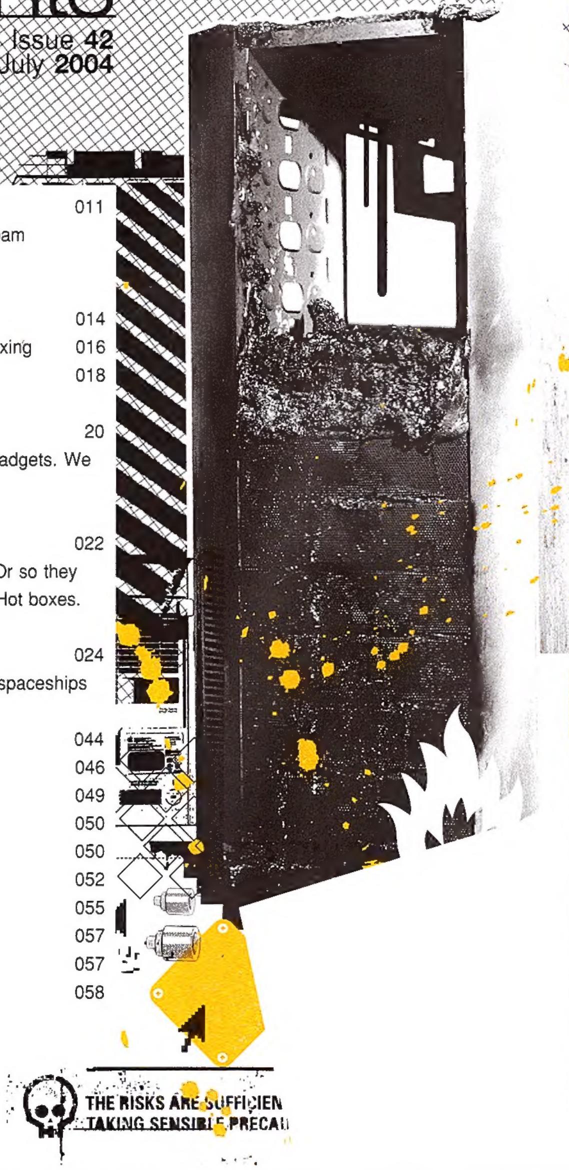

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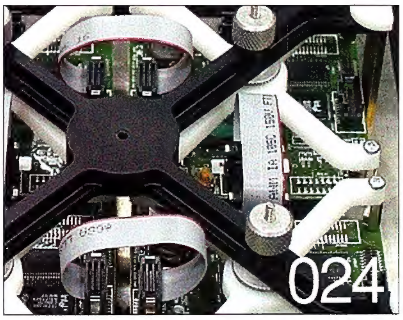
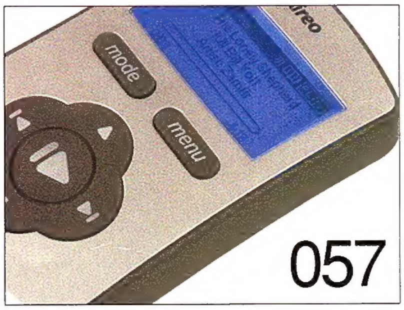
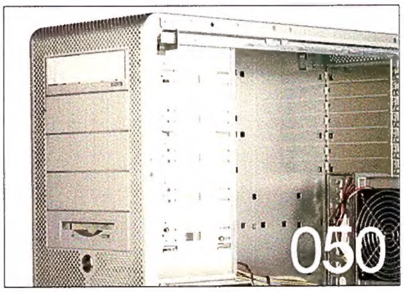
feature

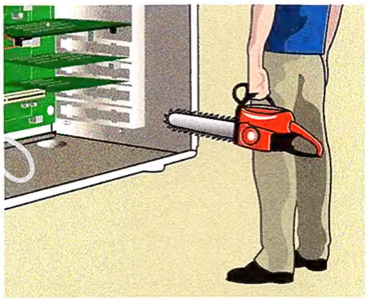
Cooling hot chips 032

Cooling. While it may be a science to all those researcher types out there, it is an art to the Atomican. A majestic, elite craft that only the most die-hard of the die-hard can master. And master well.
Like all of today's technologies, cooling has a history – and a future. We chucked Nathan Davis into an industrial grade air-conditioning unit, with nothing but a notepad and umbrella, to discover and unveil the mystery of cooling hot-hot stuff, and keeping it cool.







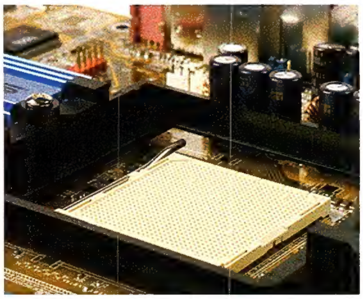


feature Overclocking 039

Tactics. One must always approach a task with a tactic. Failing that, a nice, large rubber mallet and two kilos of jalapenos always makes up for a lack of strategy when in a spot.

Take overclocking, the technique of drawing a little more power from the warp core of your computer, the skill of coaxing a few more precious points of system performance. You need an approach. You need guidance. You need a saviour.

Enter Chris 'DonutKing' Byrne, suitably attired with a notepad and umbrella, to lead you through the trickery of overclocking in this second part of his monstrous guide. Admittedly, he's no speed hacker, but he does hack more speed. From stuff.



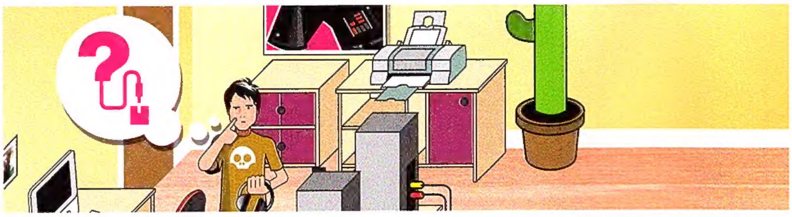
x-ray Socket wars 026

Sockets. They're everywhere. Like bits of sand in a flesh crevasse, so too are sockets numerous and annoying.

Despite the number of times you might have precariously placed a CPU onto a motherboard, every time you do it, you risk damaging hundreds and hundreds of dollars worth of equipment, thanks to the delicate, symbiotic relationship between processor and socket.

Sockets themselves are also a pain in the flesh crevasse as a new type is released seemingly every month. We tire of waving a perpetually goodbye to the upgrade path.

So, we sent John Gillooly, sensei of all that is hardware, to investigate the age-old tech of the socket, readily equipped with a notepad and umbrella.



head to head Headphones versus speakers 030

Sound! We're convinced that there's an eternal battle raging somewhere, maybe on a level of Hell, or a steam train festival in Picton, between headphones and speakers. These two great emitters of audible audio, one loud and one succinct, duel for the attention of the gamer's lobe. It's a battle only one can win, and *Atomic* is just the magazine to adjudicate. Or spectate. Or something.

Dan Rutter, garbed in an umbrella and armed with a notepad, took on the mighty task of umpiring this titanic struggle. Hear what he has to say.

edhead

O Captain, my captain

Well, here I am after 42 issues of *Atomic*, sitting in the editor's chair. Well, not really the editor's chair, Ben took that with him, along with an unsurpassed passion and belief in this crazy thing that is *Atomic*. He's gone to make www.atomicmpc.com.au something groundbreaking.

When I came into this industry three and a half years ago as a rank amateur, it was Ben who took a gamble on me, based on a pile of forum posts and two sample articles, and the fact that I can now proudly call him a friend means more than words can say. He has shaped this magazine into what it is, and done it in a way that makes us look forward to coming to work every day.

By all means it should be a sad time for us staffers on *Atomic*, our incandescently brilliant captain has left the helm of the ship. Sure he is now more *Atomic* than he has ever been, but he isn't our personal leader anymore. But the thing that keeps on surprising me as I look around the *Atomic* desk island is that there is a renewed vigor, a sense that this magazine that you're reading is headed for even better and bolder things. And the reason that is happening is because we know that our new editor is intrinsically *Atomic* and was so even before the mag was a gleam in AJB Publishing's eye.

For those who haven't stumbled across the atomicmpc.com.au forum announcements, that editor is Ashton Mills. I remember Ben first describing Ashton to me, many years ago; it mainly revolved around the fact that Ashton's was the first painted black case that Ben had ever seen. I met Ashton for the first time at an Excite@home Christmas party, laden with talk of the art of bomb defusing and laggy servers. Since that point I am proud to say that we have been good friends.

After writing for the last 36 issues of the magazine, a feat that few can lay claim to, Ashton takes the helm from issue 43, and neither myself, Logan, Timbo or Nathan could be happier (even our wonderful sub editors, Mel and Claire, are smiling more than usual). He is a true gentlemen, hardcore geek, gamer, tweaker, friend and now our editor. He has a fetish for Linux and the word 'uber', but please don't hold it against him. Prepare for something special people, we sure are...

John Gillooly
Acting Editor

We loved Cooler Master's CM Stacker case so much, we set it on fire for the cover. Thanks heaps Cooler Master for letting us burn your baby.

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Editorial and product submission: *Atomic* welcomes all information on new and upgraded products and services for possible editorial coverage. However, we respectfully point out that the magazine is not obliged to either review or return unsolicited products. The Editor welcomes ideas for articles, preferably sent in outline form, with details of the author's background and a few samples of previously published work. We cannot accept responsibility for unsolicited copy and stress that it may take some time for a reply relating to these submissions to be sent out.

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CDGuide

Atomic White Label Games CD

Please insert Play CD

Great CD this month – games, and lots of them! Plenty to play, explore and beat… more than enough to keep you occupied for a long, long time. Awesome is the word.

EGULARS

CD BREAKDOWN

Compression tools

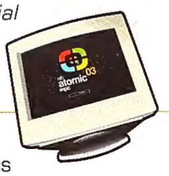
Everyone's a fan of compression tools. Whether you need them to unpack something we have on the CD, or want to pack a few files yourself, compression tools are useful and funky. As always, we've included the best and most prevalent archiving programs on the CD, so no matter what compression format you're up against, you'll have the right tools for the job.

Odd's end

Otherwise known as the miscellaneous section, Odd's end contains all the, well, odds and ends that don't quite fit in the other categories. It's also where we put reader-requested applications, such as Mozilla Firefox and Adobe Acrobat Reader. Like to see something included here? Then fire us an email at cd@atomicmpc.com.au!

Magazine

Solid editorial content. Pure and simple. Right now, it contains the *Atomic* Benchmarks page, which once resided in the magazine. By having it on the CD, we've been able to add hyperlinks and additional infomartion that wouldn't have fit otherwise. So it's win-win! Be sure to keep an eye on this space, as we continue to look for the most awesome of content to stick in this section. *Super special Atomic* content.



Boot sector

Drivers, drivers and lots more drivers. This month we culled the list to just the essential few, including NVIDIA, ATI and Intel. Along with video card and motherboard drivers, you'll find the latest version of Microsoft's DirectX sitting in this section. If you haven't already got these updates installed, don't be shy, use them!

THE NEW STUFF

DOS and 16-bit games

Now, to the games! This category contains the games that were designed to run either in a DOS environment, or a 16-bit Windows environment. Most are older titles that are now available as freeware, and were extremely classy and enjoyable games for their time. Believe it or not, none of that charm has gone, and they are still plenty of fun to play. It's recommended you visit the websites we have provided on the CD for each game for information on how to run them correctly.

Windows and 32-bit games

Packed in here are the Windows and Linux titles. You shouldn't have any problems getting these games to work, but if you do, visit the provided websites. Most feature spiffy graphics and awesome gameplay, and you'll dedicate many an hour to completing them. We can recommend Crimsonland, Titans of Steel and Phobia 3, but be sure to check all the games out!

E3 trailers

As you may know, E3 was held in Los Angeles during May. Many, many games were shown, previewed and – in the cases of Doom 3 and Half-Life 2 – shown again. Included on this month's CD are a couple of choice game trailers for these two games, so you can check out the graphics, gameplay and general progress of these titles. Nice.

Flash competition entries

In *issue 40*, we held a Flash competition, where entrants could win a copy of Macromedia Flash MX or Studio MX. In this section, we've included the best entries that we received. They are of supreme quality, and show that the *Atomic* community is oozing creative potential. Nice work guys, nice work. Check out the Flash animation on the new CD interface to see who won.

Disclaimer

Some of the games contained on this CD may not work in a Windows environment. A few titles, including ADOM and D-Zone, will only operate correctly in a pure DOS environment. Use them at your own risk. If you need help, please contact the games' respective authors or websites, not *Atomic* or AJB Publishing, as we cannot provide support.

WHY YOU WANT ME

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Symantec patches firewall flaws

On the same day in May that Symantec updated its enterprise edition firewall, it acknowledged critical security flaws within many of its most popular firewall products.

The four vulnerabilities that were announced affect both consumer and business products of the California-based security firm.

Users of Symantec products: Norton Internet Security, Norton AntiSpam, Norton Personal Firewall, Symantec Client Firewall and Symantec Client Security are at risk, said Symantec, because of flaws within the firewall technology that the company uses in the products.

The vulnerabilities were uncovered on 19 April by eEye Digital Security, and passed along to Symantec.

Three of the security holes could allow an attacker to insert and execute code of his/her choice on the machine – a trojan horse, for instance, to control it remotely – while the fourth could result in a denial-of-service (DoS) attack that would crash the computer.

Symantec has posted a security advisory on its website and made patches available through its LiveUpdate service.

Customers running the corporate versions of Symantec Client Firewall or Symantec Client Security should download and apply the patches through their appropriate support channels, Symantec urged, while consumers using the Norton line should do a manual LiveUpdate rather than wait for the next scheduled download.

The latest group of vulnerabilities is the third since the beginning of the year. In January, Symantec fixed a LiveUpdate gaffe that could have let hackers obtain administrator rights to a PC, while in March the company noted that machines running its Norton Internet Security could be hijacked by attackers.

Firewalls? What are those *otaku* engineers over at NVIDIA up to now?

Certified by ICSA Labs, an independent tester of hardware and software-based security, NVIDIA's hardware firewall technology is set to debut in its nForce3 series of motherboard chipsets.

The nForce3 250Gb Media and Communications Processor (MCP), designed for use with AMD64 systems, will be the first core logic chipset to feature the technology which, unsurprisingly, is called NVIDIA Firewall. The chipset already sports a range of capabilities, including a HyperTransport bus interface, AGP 8x for graphics cards, Serial ATA and RAID support.

A division of TruSecure based in the US, ICSA Labs is a leading certifier of firewalls, anti-virus applications and encryption devices. The company said it was impressed with NVIDIA's efforts: 'We congratulate NVIDIA on developing a solution that offers consumers a solution for enhancing personal security and reducing overall vulnerability levels'.

The implementation was tested on its stability, accessibility, protection capabilities and logging facilities, as well as its administration features and its vulnerability to intrusion.

The growing number of highly infectious and crippling internet worms has prompted vendors to introduce hardware-level protection from hackers and viruses. AMD will be including its 'Execution Protection' technology in its Athlon 64 processors. The tech prevents viruses such as 'MSBlaster' from functioning when used in conjunction with operating systems that support the feature. Intel recently announced that it had plans to introduce a similar technology – called 'No Execute', or NX – into its processors. LB

ARM unveils low-power high-performance multiprocessor

Processor designer ARM has unveiled a synthesisable multiprocessor that can be configured for one to four processors delivering up to 2600 Dhrystone MIPS of performance.

Developed with NEC Electronics, the MPCore synthesisable multiprocessor is based on the ARMv6 architecture, which can implement the ARM Intelligent Energy Manager technology and Adaptive Shutdown technology to cut power consumption by up to 85 percent, ARM said.

'The MPCore multiprocessor supports up to four-way cache coherent symmetric multiprocessing, up to four-way asymmetric multiprocessing, or any combination of both,' ARM said in a statement. 'The ability to support multiple workloads addresses the needs of networking devices to process more packet streams and higher data throughput.'

NEC said it would design the configurable processor into products for consumer electronics, automotive and mobile markets that required high-performance and low-power specifications.

News

ShortCircuits

- There's a new game out featuring Gordon Freeman and his alien companions, but it isn't Half-Life 2. Codename: Gordon, a side-scrolling platformer developed by NuclearVision, is now available for download via Steam at no cost. It features the suited man himself in a series of Commander Keen-like scenarios. Players travel through various levels that borrow much from the original and its yet-to-be-released sequel. Although the game is technically only accessible through Valve's janky Steam, it has popped up as a download on numerous websites. For more info, check out www.halflife2d.com.

- According to a Russian security site, Cisco may have had up to 800MB of source code stolen from its network. The leaked software is said to be controller code for various bits of hardware designed to monitor and direct internet traffic (routers, modems, etc.). This news has been reported by a variety of sites; however, at the time of writing, Cisco had yet to confirm if any code was leaked.

- Yahoo has beaten Google in the race to provide 1GB of email storage to users. Those lucky enough to be a part of Yahoo Europe's online email service can look forward to never deleting an email for space again.
In April, Google announced that it would launch a free web-based email service, and would give users a 1GB email quota. Compared to other web-based email services that provide a paltry 1MB, with almost a thousand times this amount, Google's Gmail was seen as ambitious. Although one would be hard-pressed to accumulate such a large amount of email, those with speedy connections can use the 1GB of storage for other things, including images and files, just by emailing themselves the data.
Yahoo has plans to roll out 1GB email accounts in other countries, depending on the success of the service in Europe.

AUSEGAMER

They say no one is born violent nowadays. Reality television, Pokemon and High Five should have knocked the violent right out of us by about the age of 10. The big enemy of this New World Order in which fuzzy animals evade our capture and sweatdrops appear on our heads at random is none other than the humble video game.

Of course, the violence-in-video-games debate has been dragged to the ground so many times that we actually forget there are people out there who take their gaming, and more particularly what occurs within the games, just that little bit too seriously.

Over the past year, the amount of e-sports-related violence has become a central issue. We've had handguns pulled outside CXG qualifiers, Russian players beating up French journalists in their hotel rooms, shooting outside LANs and even HeatoN of SK going to work on some poor sap's skull.

With this string of violence at major e-sports events is it time we sat back and asked ourselves why we're so angry at one another?

It's hard to believe that there is a gaming community at all. You can visit any forum related to e-sports and you will see one thing – flaming. The amount of continual slander and abuse, both on these forums and in-game, has surely made online games one of the least friendly ventures in electronic entertainment.

We've expounded the brilliance of e-sports and online gaming for so long, especially here in Australia, and we're still calling it the 'next big thing' every few months; and then when the big boom doesn't happen we blame a lack of interest.

It's no big secret that the more people who get into e-sports the more support we'll get, but first we need something worth getting into. Message boards and forums are currently little more than flaming grounds in which homophobia, sexism and even racism rule. It seems that people think that their anonymity gives them some freedom from the responsibility inherent in our society to treat each other with a mutual respect. And it's killing the image of e-sports around the world. As Gabriel from cult e-comic Penny Arcade puts it, 'Normal person + anonymity + audience = total fuckwad'.

Violence isn't something new at LANs, everyone has heard a story of someone they know getting into a fight at some event. The problem has been now, as e-sports grow (albiet slowly), more and more people are coming face to face with those they flame online and it's sparking extreme violence. If a sexist, racist, homophobic, classist community isn't enough to throw off potential supporters of e-sports, the HeatoN headbeating is a sure-fire winner.

Truth to tell, it's not something new. We've always thrown and hit things while gaming, it's just a way to vent our frustration when something doesn't go our way. We've simply graduated from taking our everyday anger out on our SNES controller and moved on to abusing random people online. So before you flick hot ash in your eye, leave your money at an ATM and get dumped by your significant other, then come home to accuse half the world of being smacktards, take a big breath and count to three. If this doesn't work, swear.

Stuart Denham

atomican

Factoid #1: *There are five different types of SPAM manufactured by Hormel Foods Corporation, none of which are a choking hazard.*
Factoid #2: *Only one type of spam is manufactured in the Atomic Forums, but it does represent a choking hazard.*

Forum spam is a post with no point. Uninteresting. Serving no purpose. Neither useful nor entertaining.

It may be a random irrelevant statement, a single-word answer to a complex question, or a drunken incoherent rambling. Whatever form it takes, spam wastes time and bandwidth. It distracts from quality content. Like that annoying greasy build-up in your mouse ball, it gums up the works, choking the smooth flow of debate and banter.

So, spam is bad, 'mkay? And spammers should be belittled, badgered and banished, right?

Well, it's not that simple.

Like a barbecue in a cyclone, spam is in the eye of the beholder. One person's 'spam' is another's 'casual banter'. Even drunken incoherent rambling may seem incredibly funny to ... well, another drunken incoherent rambler.

And there's the rub. Not all Atomicans *quite* agree on what *is* and *is not* spam. The lack of an engraved stone tablet upon which is writ a definition of spam has led to some strange forum phenomena.

The first is the *Spamoebius Loop*. It occurs when someone posts 'this is spam' in a spam thread, thereby adding to the thread more of the spam that they claim to abhor.

The next is the *Rankenphile*. In a misguided quest to quickly achieve the next rank in the forums, they make short meaningless posts in as many threads as possible, rarely initiating interesting threads themselves. The great irony is that what they in gain postcount, they lose in respect from their fellow Atomicans.

And finally there is the *Spamissionary*. They argue vehemently for the right to fill the *Atomic* Forums with spam, justifying their point of view with comments such as 'spamming is fun', 'this is the General Forum so anything goes', and 'everything is interesting to someone, so nothing is ever spam'. Strangely, they refuse to go to a forum where their spam would be welcomed.

Factoid #3: *Hormel Foods Corporation's newest variety of SPAM is 'turkey'.* Coincidence?

Virt

POTM 42

Duke vs Commander Keen
/forums.asp?s=1&c=1&t=37588
By Lord Teaspoon

Despite an inauspicious start to a thread that began without a great deal of considered thought, Lord Teaspoon jumped in and threw a blanket of gold over us to warm it all up. His irrefutable reasoning for why Duke is da man showcased the Atomican smartness and conviction in a way that would do Duke proud.

What's Hot

☐ Normal mapping – real 3D with prettiness
☐ S.T.A.L.K.E.R. – pants-wetting gameplay
☐ Meets – eating and drinking with fun included
☐ Bajingo – more exciting than a banjo
☐ Flash – active animation

What's Not

☐ Bump mapping – lumpy and frumpy
☐ Half-Life 2 – barely has half a life left
☐ Feet – down with imperial measurements!
☐ Poontang – keep it in your pantaloons
☐ Rash – the burning, the burning

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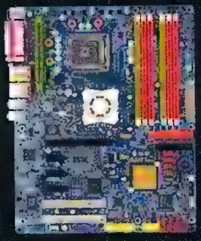

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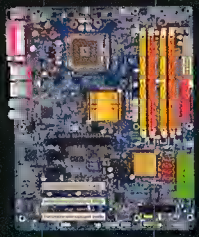

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TECHNOLOGY

Power struggle

Feeling a bit burnt out? Daniel Rutter zaps out some sparky info about your electricity supply.

Let's talk about the endlessly fascinating, entertaining and, let's admit it, somewhat arousing topic of power filtering.

Most computer users are vaguely aware that it's a good thing to filter the AC going into your precious multi-gigahertz baby. Surges and spikes can blow it up, slumps and blackouts can shut it down.

Here in Australia, we generally have pretty good AC power. Hook up a fancy phase meter to the AC supply and you'll see it wandering all over the place, but that's cool; things that plug into the mains are made to cope with some degree of input lousiness. And PC Power Supply Units are, generally, *more* tolerant of weird input than most appliances.

But when the guy next door starts playing with his new million amp welder, or your elderly fridge and freezer both click their squeaky old compressors on at the same time, or lightning strikes a suburb away, it's quite possible for big nasty spikes to appear on the mains. Nearby lightning strikes are particularly nasty, since they can put large currents on phone and cable TV wires, frying computer gear that way.

So you buy a surge/spike protector powerboard and you're fine, right? After all, there are quite a few brands of powerboard that now come with an impressive Connected Equipment Warranty, offering thousands or even tens of thousands of dollars of coverage if something plugged in through the powerboard gets toasted.

How can you lose?

Well, you can lose technically, and you can lose legally.

The technical side is simple enough. No ordinary cheap powerboard ('cheap' definitely includes '$150') actually provides very good protection from line current gremlins. It may protect you once from a big-ish spike, or several times from smaller ones, but it won't last forever.

Cheap surge filters are all based around components called Metal-Oxide Varistors (MOVs). MOVs pass current only when the voltage across them is above a set value, and they react to overcurrent in microseconds. A circuit breaker or fuse can take tens of milliseconds to trip or blow; that's much too slow for spike suppression.

Unfortunately, MOVs will only work a few times, at best. The more work they have to do, the closer to death they come. A surge/spike powerboard with a toasted MOV is... just a powerboard.

Better surge/spike boards are meant to tell you when their MOVs have died via a little light or even a buzzer, but they commonly actually don't. A surge/spike filter that's been in use for some years and still reports its MOV as perfectly healthy is, probably, lying.

Better surge suppressors use two other kinds of spike-sinking components. Gas arrestor tubes are much tougher than MOVs, but respond too slowly to be useful for many applications, including computer protection. But they're present in better power filters because they can handle the load of a really big surge.

And then there are Silicon Avalanche Diodes (SADs), which are between gas tubes and MOVs in toughness, but as fast as a MOV. They're more expensive, though, which is why cheap surge/spike filters never contain them.

The best surge/spike suppressors are gas arrestor tubes *and* SADs, and possibly MOVs as well. Proper 'power conditioners' go on to include a great big heavy iron transformer, whose 50Hz resonance and enormous inductance blocks surges and spikes quite well too. This makes the power filter large and heavy and easily as expensive as a mid-range Uninterruptible Power Supply (UPS), but if there's an aluminium smelter down the road from you, this is the kind of filter you want. Rather than faff around buying tons of flaky powerboard filters for all of your electrical outlets, you should get an electrician to install one giant power conditioner at your fuse box.

So that's the technical problem with surge/spike filters. The legal problem has to do with those increasingly popular Connected Equipment Warranties (CEWs).

First up, you'd better still have the receipt for your surge protector. The warranty probably only covers the original purchaser.

And if you can find a cheap power filter whose CEW covers new-for-old replacement, I'd like to see it. Normally, they give you blue book used value for your gear. Blue book value for a tweaky 3GHz P4 box with a RADEON 9800 may be the same as for a Compaq with the same basic specs.

If the guarantors really want to weasel out of the deal, they can insist on proof that every wire going into the toasted equipment was protected with their gear. They can insist on proof that you weren't using an extension cord. They can insist on proof that you weren't overloading the surge protector. Hey, maybe the spike was just bigger than the filter was meant to deal with!

Did the filter protect you from a spike last week, burn out, and so not protect you from a spike this week? If so, then no payout.

Bit of a Catch 22 there, really; if the filter's not burned out then they can say you didn't have it plugged in at all, and if it is then they can say that it was dead already, and you should have stuck your head behind your desk every day to see whether the little light had gone out.

The take-home message from all of this is that quality power filtering isn't cheap. Fortunately, though, most Aussies don't *need* quality power filtering. Go ahead and buy dirt cheap no-CEW filter-boards, and be merry.

> A circuit breaker or fuse can take tens of milliseconds to trip or blow; that's much too slow for spike suppression.

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Creatively speaking

We are at our best when we can share and build on the achievements of others. Is it worth locking down the past for the sake of the proverbial greenback? Ashton Mills waxes creatively.

I'd like to dedicate my last Technica Obscura to an important issue, especially as it is being increasingly applied to the things we hold dear – technology, music, software and the internet. This story is a long one, so I can only give you the executive summary.

We hear a lot about copyright, patents, and the legal brouhaha that seems to be its own currency in our decade, especially in the US. Today, copyright is used almost like a club by organisations like the RIAA and MPAA to beat money out of people on both sides of the equation. In truth copyright was designed to protect the interests of authors and artists, not the middleman peddling their wares.

But everything we have, everything we are, is inherently influenced by the past. Your ideas, and what you create, are the accumulated experiences of *other people's* ideas and *other people's* creations. Musicians are always able to name the musicians that inspired them. Scientists can create what they do today only because scientists before them laid down the groundwork. It is not possible for our society to advance without free access to the work of others. Ultimately, *all works are derivative works.*

For this reason, in 1710, copyright was a term of 14 years, optionally renewable to a maximum 28 years. That was, if you created a work you had full control over how you wanted it used, including to make money. This way authors had incentive to continue to create works. But after 14 years, it entered the 'public domain' – anyone could re-use or sell it, or use it as a basis for his/her own work. Here the advantage is clear – a balance between private and public gain, creative reward and the enrichment of society.

The problem? Today copyright as it stands in the States, which often leads the world, is *life of the author plus 90 years.* What this means is that music, books, film, art and even software being created today won't enter the public domain for at least 100 years.

It'll be locked up by whoever owns the copyright, by organisations like the RIAA and MPAA, even if the works are no longer profitable for them. Long after the authors are dead, long after the work has stopped making money, it *still* won't be available to inspire and let others build upon it. Creativity, culture, and society itself will be stifled. It's already being stifled. As Stanford Law Professor Lawrence Lessig points out: never in our history have *fewer* people controlled *more* of the evolution of our culture.

> It's no coincidence that the term of copyright in the US has been extended... occurring just as Mickey Mouse, first created in 1928, would otherwise enter the public domain.

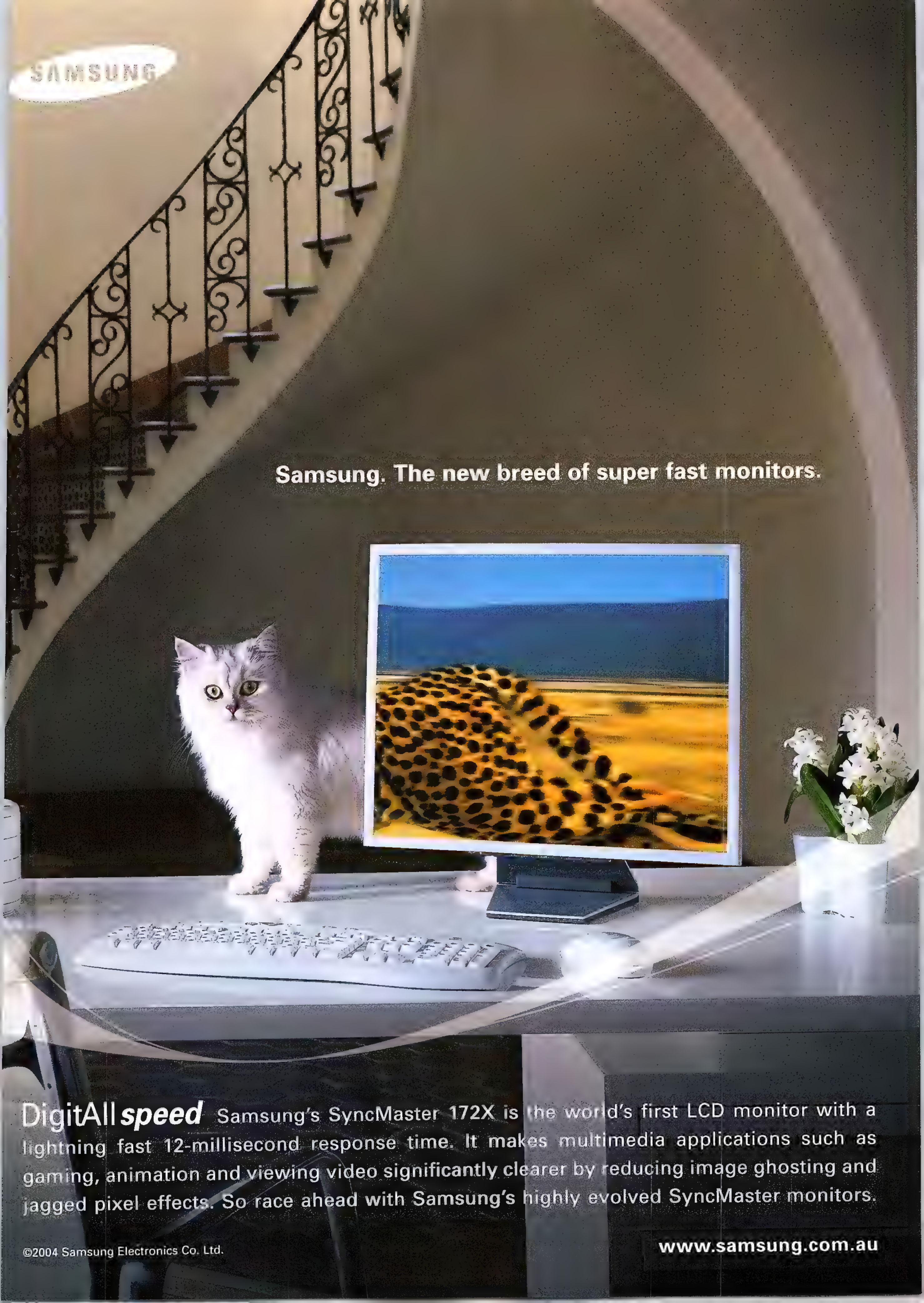
Take Disney as a prominent example – Disney's most famous (and profitable) characters and movies all come from classic stories, tales and cultural myths. All, in one form or another, public domain. *The Lion King* is a re-telling of *Kimba, The White Lion. Aladdin* draws extensively on *The Thief of Baghdad. The Little Mermaid* was written by Hans Christian Andersen. *Mulan* is based on a Chinese legend. *Snow White, Cinderella*, and *The Beauty and the Beast* are all well known fairy tales, and so on. Yet, if you wanted to create work from Disney's stories, its characters, or its art, you wouldn't be able to. Disney Corporation is happy to build on the work of others, but not allow others to do the same. It's no coincidence that the term of copyright in the US has been extended 11 times in the past 40 years (compared to just *two* times in the 250 years prior to that), most of them occurring just as Mickey Mouse, first created in 1928, would otherwise enter the public domain.

Anyone can read, copy, perform or use Shakespeare because his works are public domain. Can you imagine a world where the last 100 years of creativity is unavailable for everyone to share and innovate upon? And at what cost?

Think about the music, literature, film, art and software that inspires you, and being unable to draw from them.

This is why a new movement called the Creative Commons was born (www.creativecommons.org). The problem with copyright today is that all works are automatically copyrighted upon creation, and by default *all rights are reserved.* Unless the author explicitly gives permission, no freedoms are granted. Creative Commons allows authors to create a licence that protects their interests, but provides freedoms as well, right from the start. For example, perhaps you're a writer who sells a new book through stores, but also makes it available to distribute for free online, but only for non-commercial use. Or you're a musician who's happy to have your songs freely performed in public, but only if they give you credit. There are all manner of freedoms you can grant in any combination. Creative Commons allows authors to easily define how they want to use their work, and how others may use it as well, free of legal doubt. The licences complement copyright law, are free, and can be generated online. Already some one million works have been released through Creative Commons, but this is a drop in the ocean of past and current human creativity.

In Australia copyright is life plus 50 years, but this may soon increase if the FTA goes through (*covered last month*). So raise your voice against this if you can, and when you create works, keep in mind: how do you want them used, both now and long after you're gone? Consider how everything we have today was built upon the creative expression of those who came before us. I'm going to draw right now from the past and quote Isaac Newton, who said 'If I have seen further it is by standing on the shoulders of giants'. Amen.



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Light up my life

What happens when we can run everything at 1600 x 1200 with full FSAA and anisotropy at 60 fps? Tim Dean reckons we switch on the GI.

A world without photons is a world I'd rather not live in. Despite the fact I couldn't stay alive in a world like that, it would be a cold, dark, colourless, and electromagnetically-challenged world. A world without friction, or magnets (and therefore, *sans* MacGyver), without microwave ovens, or other cool things like specular highlights, lens flares, shadows, or transparency.

In fact, it is a world much like this apocalyptic vision that we have spent much of our lives in – at least by proxy. Thankfully, these days we have graphics cards with things like vertex and pixel shaders, FSAA and anisotropic filtering. Thanks to these innovations, our virtual photons bound about in their virtual environments, lighting things up, causing shadows, gathering colour and passing through things. Ace.

Still, our virtual world lacks things our real world has in rich abundance – things like sub-surface scattering of light; caustics (where light passes through an object to be focused on the other side); diffuse reflections; motion blur; specular reflections; lustre; and most importantly: speed. Not only does our world have all the best that graphics has to offer, it runs at a seamlessly smooth rate.

It's the aspiration to bring this 'photorealism' to realtime gaming that is driving graphics technology – but we're about to go through somewhat of a shift in direction compared to the last few years. In the next two years or so, we'll reach a threshold in graphics capability, and see things head off in a different direction technologically.

Realtime 3D today still runs on very much the same principles as it did at its inception. It's pretty much always been a two-step process of building geometry, then painting textures onto surfaces. Sure we have plenty of whiz-bang do-dads to make this process work faster and look prettier, but really, the principles are the same today as they were for the old S3 Virge.

Besides increasing the geometric complexity and improving the quality of the texturing effects, another of the main emphases in the development of realtime 3D technology has been speed. It's all well and good to render a startling example of a shiny teapot overnight, but that misses the key point of 'realtime'.

Another factor tied to both speed and quality has been increasing the resolution we can render at in realtime.

This battle is about fill-rate – or the number of pixels the hardware can spit up on screen each second.

The thing is, we're nearing the point where we've virtually 'perfected' this model of realtime 3D. In the not-too distant future, we can expect to have hardware that is capable of pumping out more than enough geometry, as well as plenty of filtered, shaded and textured pixels, with massive levels of anisotropy and anti-aliasing, all at smooth framerates and at the maximum resolution we can expect monitors to support for some time into the future.

Great – does that mean we've done? Does that mean the likes of NVIDIA and ATI can rest on their laurels and the emphasis will shift back to the CPU? Well, to an extent and there's plenty more we can do with realtime graphics to make things look better – but that's going to take a fairly fundamental change in the way we do things. And when I say 'things', I really mean 'lighting'.

Virtual photons are the way of the future. You can have a scene with bugger all geometry, guff textures and no physics, but if you have killer lighting, then everything suddenly looks kind of 'real'.

Sure, there's lots of work to be done when it comes to physics, AI as well as animation – such as creating skeletal models with musculature and skin – but it's lighting that will drive 3D technology over the next five or more years.

The fundamental shift will be the move from old-skool lighting – aka 'local illumination' (LI) – ie: using fudged texture mapping filters applied on abstracted geometry normals through vertex shaders etc – to using more traditional lighting techniques as found in professional non-realtime 3D apps.

Enter 'global illumination' (GI). This is where the scene is lighted using techniques such as ray-tracing, radiosity and photon mapping. These techniques are far more advanced and can deliver far more photorealistic results. They do this by taking the entire scene into account (well, at least more of the scene than LI techniques do).

> Enter 'global illumination' (GI). This is where the scene is lighted using techniques such as ray-tracing, radiosity and photon mapping.

This means we start getting more of the effects we see in the real world that can subtly, but significantly, affect the way a scene looks. For example, when a photon hurtles out of a light source in the real world, it might bounce off (or through) several objects before it gets absorbed by the eye. This means every object that is bathed in light will affect the lighting of other objects around it – this is the essence of radiosity.

The thing is, these GI techniques also require far more processing power. It's looking as though, at the end of the day, it will be photon mapping that replaces LI techniques in a couple of years' time, and thankfully, there are plenty of places the 3D hardware developers can cheat when it comes to making photon mapping an efficient technique.

So, as we're about to reach the threshold of the old guard in 3D, you can expect to see a shift to the new world of GI very soon. This also brings the exciting prospect of other competitors entering the market. There are plenty of companies with loads of experience in hardware 3D of this kind, such as IBM, Silicon Graphics, 3dlabs etc, so perhaps we'll even see a new wave of competition hit the scene.

I'm looking forward to that.

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1 Conductorfield Fingerprint Flash Drive

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2 JoyTech Xbox Wireless Neo S Controller

Supplier: Take 2 Interactive
Website: www.joytech.net
Phone: (02) 9482 3455 **Price:** $69.95

While having a tangle of controller cables weaved through your living room is hella cool in a kinda neo-cobwebby dungeon way, it also becomes an annoyance of huge proportions. Enter JoyTech with its Wireless Neo S controller for the Xbox. It is slightly smaller than a standard Xbox Controller S, and uses the 2.4GHz wireless band to communicate with a base station that plugs into your Xbox. Its only problem is the size, which is fine for most but not recommended for those with large hands.

3 MSI BTMSD mouse+BToes

Supplier: MSI
Website: www.msicomputer.com.au
Phone: (02) 9748 0070 **Price:** TBA

Bluetooth has promised much but delivered sweet FA. It's not a lack of software support, it's just Bluetooth itself sucks. Doohickies such as this mouse keep the protocol going, seeing as they don't require masses of throughput. Equipped with a Bluetooth dongle, MSI felt it should be named Bluetoes. Which is disturbingly freaky. Plenty of distance but it still fits the latency bill, so it's not really for gaming. When wireless USB finally comes to light, Bluetooth is a gonner, but before then, perhaps a Greenthigh keyboard variant is next?

4 USB Mini Aquarium

Supplier: Anyware
Website: www.anyware.com.au
Phone: (07) 3856 3999 **Price:** $19

In Gearboxes we've alerted you to the availability of such consumer wonders as the USB Massage Pad and the USB coffee cup warmer. Like NASA, whatever freaks are responsible for making this stuff are always pushing the edges of tech and innovation. Thus, we present the USB Mini Aquarium. Boop boop diddum duddum waddum choo. The little tank has a pleasant tropical theme, and includes a couple of plastic Nemos. A little motor swirls the water around and flashy lights light up Nemo to much delight. All under the dam.

5 TeraValue NewGen5

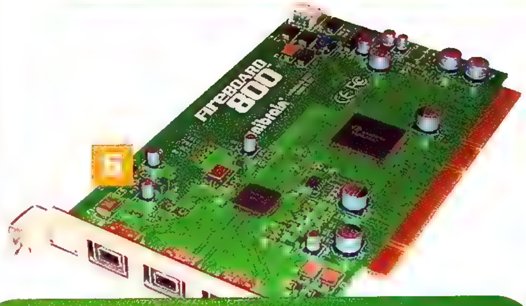
Supplier: EFx Systems
Website: www.efx.com.au
Phone: (02) 9742 1900
Price: $299 (128MB); $399 (256MB); $549 (512MB)

For an MP3 player, the NewGen5 is full of features, with an FM radio, recording, lyrics display and an SD memory slot. Unfortunately, the display really let it down – its backplate is the usual LCD green but when buttons are pressed, the characters turn light blue from the non-adjustable backlight. This makes reading impossible in normal lighting conditions. The buttons have very slow response and the cover flap for the inputs requires fiddling to open. It had potential.

7 Sunwave SRC-3000 touchscreen remote control

Supplier: Altronics
Website: www.altronics.com.au
Phone: 1300 797 007 **Price:** $199

Universal controls, by default, are ugly. But this sexy black control fixes the cursed mess. The 244g unit does away with physical buttons, programming all controls into the blue-backlit touch panel. There are masses of pre-programmed codes and naturally it can learn from any IR device. Program 60-phase macros; there's adjustable 'intelligent' backlighting and auto-power-on motion detection but damnit, no integrated pong. The screen's reflective surface was a slight problem, but nonetheless, an arousing piece of kit.



6 Unibrain FireBoard 800 IEEE P1394b PCI card

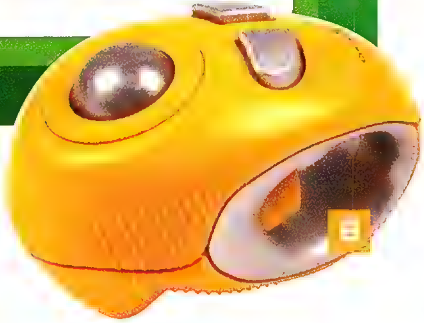
Supplier: Unibrain S.A. (Europe)
Website: www.unibrain.com
Phone: N/A **Price:** US$79.95

The 'new generation' FireWire standard (IEEE 1394b) has finally reached production, delivering 800Mb/s data transfer and supporting 1GB signalling rates. Technically, it's a 33-MHz/64-bit (or 33-MHz/32-bit selectable) PCI OHCI host adaptor capable of giving amazing throughput and bandwidth, moving data between the PCI and 1394 busses with minimal overhead. When teamed-up with a 1394b external enclosure and a 9-pin cable, this is the new 'plug and play' standard to beat in terms of external connectivity.

8 Geciman Track mouse

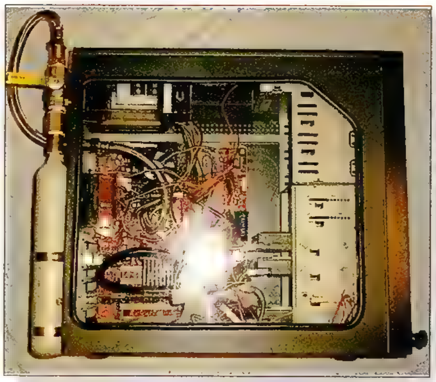
Supplier: Geciman
Website: www.geciman.com
Phone: (02) 9744 5676
Price: $40 (mention '*Atomic*' at checkout)

Cross a Borg weapon and a mini submarine and you have this trackball mouse. For your thumb. It's not precisely useful either, seeing as it's a trackball (apologies to the rare trackballers out there, we feel for you) and the two buttons above the ball are difficult to reach, so you'll nuke your machine quicker than you can right click. Design isn't its best attribute and as we failed to find any useable ingeniousity on it, it's not really recommendable. Get it because it's weird.



Hotbox

Albi's CO_2 Box



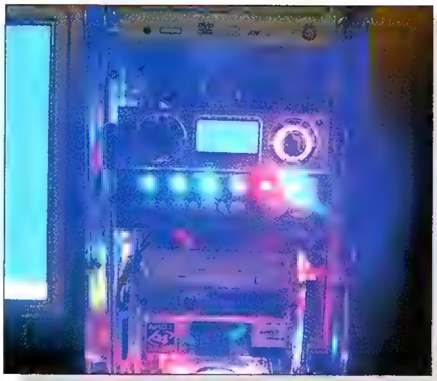
Technical details

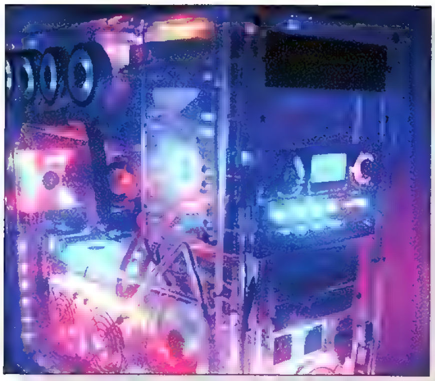
- P4 2.4GHz @ 3.06GHz
- MSI 865PE Neo2 motherboard
- GeForce2 GTS
- 2x 256MB dual channel DDR400
- 36GB WD Raptor 10,000rpm
- 2x 120GB Seagate 7200rpm
- Red neon
- Car cigarette lighter
- CO^2 NOS injection system
- Fan speed controller (home made)
- ASUS DVD 8x writer
- Modded 350W PSU
- 90mm blowhole
- 2x 80mm air intake fans

This case started at a party when my friend's car got totalled. The only working component left was the cig lighter so I decided to mod this into my case. This provided problems as my PSU could only handle 10 amps on the 12V rail, the cig lighter draws 6 amps and the P4 draws a max of 8 amps, causing the PSU to explode. The power supply was modded up from 10 to 20. Then a window was added to the PSU. I then thought why stop there? I put a 90mm blow hole in the top and handles for transport to LANs.

But my true inspiration came while sitting on the john. The CO_2 NOS injection system! The idea behind this system is that CO_2 is cold and non-explosive. This did not go without consequence as the CO_2 cylinder has a pressure of about 2000psi and during the building the valve exploded twice due to a leak, not something you want to try at home! Some people call me insane but personally I think I'm just eccentric, this PC is great for LANs and is a perfect way to express my opinion on individuality in the PC modding scene.

Banzai's Light House





Technical details

- Antec 480W True Blue
- AMD 3200+
- Gigabyte GA-7NNXP motherboard
- PowerColor RADEON 9800XT
- 1GB Corsair TwinX-3200 LL
- Creative Soundblaster Audigy 2 ZS
- 120GB/160GB Seagate ATA
- Samsung CD/DVD-RW
- Cooler Master Aerogate II
- 8x 80cm LED colour fans
- 2x VGA light up dual fans
- Antec music control 4x UV lights
- Multi fan speed controller

Is has been take me for while to think of, how can I build one a powerful gaming machine? Now my dream come true. Take me two weeks to builder it, I call that is 'BANZAI'S LIGHT HOUSE'. I'm so enjoy it, totally mad.

The Aerogate2 was control all my computer temperature, CPU/HDD/VGA/CASE. Also change seven colours. It's beauty look, but really impress me is Cooler Master JET fan, make CPU so cooler only 30-35ºC.

I cutter off five fan hole, two 80cm LED fan, three small hole I used old CPU fans, to make the case temperature down to 25-30ºC. It's ready make a difference. The four blue light legs stand make the case outstanding, when I look at my PC, I love every moment my computer. I wish all other people will like too, also like thanks to Steven and Christ for help, not them won't make that happen. Sky light, wonderful night, in my night...

Walt Disney was never cryogenically frozen. He is buried at Forest Lawn, Glendale in California.

Pteropid's Painful Pewter

Technical details

- AMD Barton 2600+ @ 2.19GHz (400FSB)
- RADEON 9800 PRO @ 405/750
- ASUS A7N8X-X motherboard
- 512MB PC3200 RAM
- Fortissimo III 7.1 sound
- Lite-On DVD+/-RW
- Pioneer DVD-ROM
- 80GB Maxtor HDD
- Analog TV tuner
- Cooler Master Aerogate II
- Thermaltake Volcano 7+
- Logitech cordless keyboard and mouse

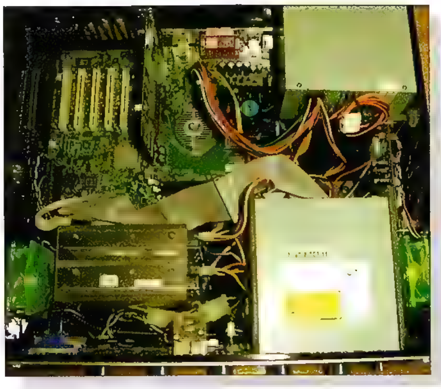
As a microbiologist I get to see the biohazard symbol all day every day and I still think it looks cool. So naturally all it took was *Atomic* and an old $50 beige case I had lying around to inspire me to spend seven hours with a nibbling tool slicing my fingers to pieces.

The entire system was built in preparation for Doom3 and HL2 and only cost around $1600 to build. I wanted something neat and classy-looking for the lounge room, but it had to look like it meant business.

Thanks to the good old tube of death mod, the overclocked CPU sits in the mid 50s under load. It runs my DVDs, MP3s and DiVxs and lures me away from my studies with its cold cathode goodness. Oh yeah and I finally get to see C.O.D in all its glory. I call it Painful Pewter after the gashes I received from the shredded metal modding. There's blood all over the case that I can't get off, it sort of blends into the matt black paint job.

The next step involves RAID, 64-bit and water cooling.

Wiley's Marantz case



Technical details

- Athlon XP 2000+ CPU
- EPoX 8RGA+ motherboard
- 1GB PC2700
- 80GB WD 8MB HDD
- 40GB Hitachi HDD
- ATI RADEON 8500LE
- Lite-On 4x DVD-RW
- Onboard audio
- 4x hard drive bays
- VU-Meter is original from the 2220B with LED backlight
- 17in x 18in x 6in case dimensions
- Fake headphone jack… who really uses that anyway?

The idea for this case came from a friend who had seen my previous work and wanted something built for him. After searching for a few weeks, I found a 2220b on eBay. I quickly ditched the original casing of the receiver because it was much too small. Next I increased the size to hold standard ATX hardware and put together a new box made of 0.25in black acrylic. The sides have 0.125in aluminium inlayed into the acrylic and are nearly flush with the surface. Also on the sides are the built-in fan grills which were made using a scroll-saw. The logo on the top was inlayed and filled with a silver-pigmented epoxy. Later it was polished to a brilliant shine. About the only things used from the original receiver itself are the front face and feet. It took six to eight weeks to complete and no animals were harmed in the making of this. My cat simply loved the case because it gave her a warm spot to sleep.

Hotbox of the month wins the Leadtek Winfast K7 NCR18D!

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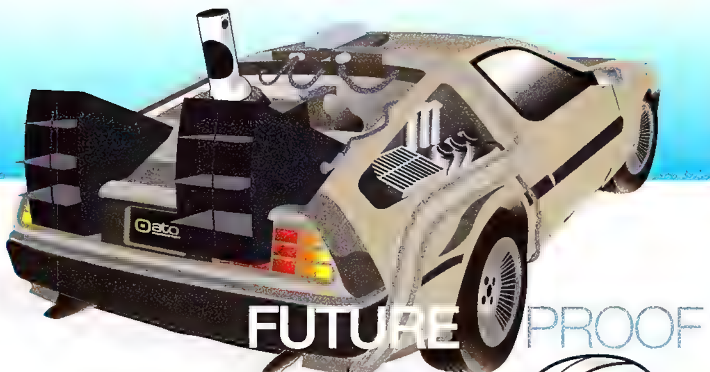
- Leadtek Winfast K7 NCR18D
- nForce2 Ultra 400



Sensors alive!

Logan Booker investigates the future of self-aware space vehicles.

One of the more blue-sky goals of distributed computing is the 'intelligent system'; a collection of autonomous agents that share processing power, sensors and other resources to accomplish a common task. A major distinction between pure distributed computing and intelligent systems is complexity. Most projects underway in the area of intelligent systems focus on elaborate applications designed to monitor, adapt, act and learn, rather than to just solve large problems. A good example of such a 'self-aware' system is an Ageless Aerospace Vehicle, or AAV.

Right now, CSIRO is working with NASA to develop the necessary software and hardware to get AAV 'off the ground'. Internally, the project is a collaborative effort between CSIRO's Industrial Physics Division in Lindfield NSW, and Information and Communication Technologies (ICT) Centre situated in Marsfield, NSW.

CSIRO's Dr Tony Farmer, based at Lindfield, leads the 30-odd person research team, which itself is split between the two facilities.

The focus of CSIRO's research is not so much to build a working aircraft, but to form a foundation of reliable, functional technology – technology that can be used in a number of areas. At the moment, a 'concept demonstrator' of CSIRO's research resides at Lindfield, and was recently displayed at this year's CeBit trade show in Sydney. The hexagonal construct, which serves as a testbed for ongoing AAV research, contains 768 sensors and 192 processors, packaged in 192 modules. Each module features an aluminium plate, to which are attached four piezoelectric impact sensors, and these plates form the outer layer of the concept demonstrator. Although made from commercially available hardware, the technology itself was built within CSIRO and makes use of extremely modern DSP chips.

'There are two main aspects to this concept demonstrator – the construction of the electronic hardware (sensors, data analysis, communications) and the development of the intelligent mathematical algorithms deployed on the distributed network,' says Farmer. 'The present version uses piezoelectric sensors to detect, locate and quantify the energy of an impact. The intelligent algorithms are then able to identify and isolate the damaged region as a precursor to decision making.'

The purpose of this intricate setup is to create a self-aware, self-repairing and self-maintaining network of agents (in this case, aluminium 'skin' modules), which, for lack of a better word, are 'ageless'. Although it's nigh impossible to design a system that can entirely mitigate the effects of wear and tear, a vehicle based on these principles would far outlast a conventional vehicle that relies solely on the raw hardiness of its construction.

'The AAV vision is of structural systems that do not age or fail. For example, aerospace vehicles that monitor themselves and their environment ... learn, adapt, behave intelligently and can make and implement decisions. The project aim is to develop and critically examine concepts for integrated smart sensing and communication networks, with the ultimate goal of developing a self-monitoring, self-repairing aerospace vehicle,' says Farmer.

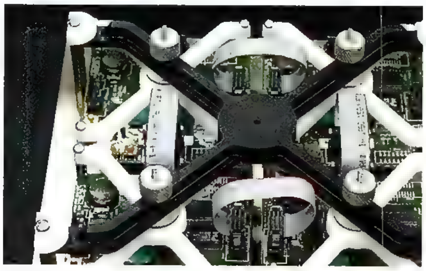
Perhaps the most crucial aspect of any network is its ability to communicate, and, rather than fight the complexity this involves, CSIRO plans to use it to its advantage. 'Most designers of complex engineering systems try to minimise (ideally eliminate) the complex behaviour so that their problem is tractable – we are looking at ways of using the complexity to our advantage.

'We are attempting to harness the emergent behaviour of the system to achieve high-level goals in a robust, efficient manner. This is a relatively novel approach in that we accept that a large sensor network will invariably exhibit complex behaviour and we try to work with it.'

According to Farmer, each module, or 'agent', only communicates with those immediately surrounding it and 'collectively they are able to provide a level of local intelligence.

'If required, dynamic hierarchies of agents can form to provide a higher level of intelligence across larger areas of the structure,' he says.

This 'distributed intelligence', combined with the redundancy inherent with the decentralised nature of the network, means that a vehicle based on the design can take a great deal of punishment from both internal and external sources before failing.



ABOVE: One of the 192 sensor modules used in CSIRO's concept demonstrator.

The current focus of the project is the detection and analysis of micro-meteorite impacts using the sensor network, and while there is still plenty of work to be done, Farmer is optimistic of its applications outside of the aeronautic industry.

'The concepts can be applied to bridges, buildings, agriculture, energy management, emergency management... Whether it is for aerospace vehicles, bridges or buildings, Structural Health Management (SHM) is an increasing trend and the general concepts and technologies we are developing for large sensor networks represent a major step forward.' LB

Petering PAN

John Gillooly looks at the new technology that gives huge bandwidth at 10 metres but virtually none at 20.

The term 'dog's breakfast' is not to be used lightly, but with Bluetooth the canine had access to an all you can eat buffet. Originating as a technology developed by Ericsson for connecting mobile phone accessories; it evolved into a pseudo standard spearheaded by the Bluetooth Special Interest Group.

It is a short-range wireless connectivity technology, and while it has been shoehorned into many apps, like wireless networking and peripheral connections, it has faltered due to a combination of poorly defined standards and often horrendous software interfaces.

In an ideal world, Bluetooth would have enabled the concept of the Personal Area Network (PAN), where all the devices carried around with you talked seamlessly with each other at the rate of 1Mb/s via the 2.4GHz wireless frequency. The reality is that it's rare to get a suite of hardware that is able to interact, thanks to shortcomings in the way Bluetooth was defined.

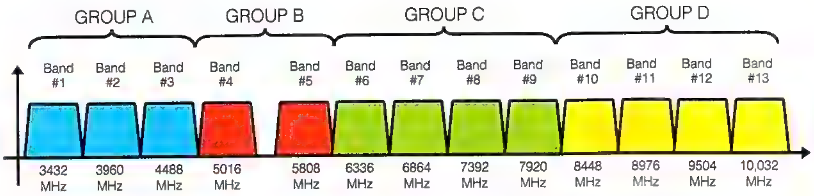
While Bluetooth is looking more and more like a lost cause, the PAN concept is undergoing somewhat of a revival, riding on the back of the Digital Home push as part of a new IEEE standard for a technology called Ultra wideband (UWB). UWB falls under the designation 802.15.3a and is being driven by a group called the Multiband OFDM alliance.

The 802.15.3a standard defines a PHY layer for UWB communication. On top of this physical layer will sit various new interconnect protocols, the first of which is set to be Wireless USB. The reason for choosing UWB as the technology for PANs lies in its ability to supply high data throughput rates over a short range. The key to enabling this lies in the very nature of UWB signals. In commercial apps Ultra wideband refers to radio signals with a bandwidth 500MHz or greater, and contrasts with the Narrowband signals used for tech like 802.11 wireless networking.

For the 802.15.3a standard, the IEEE is focusing on smearing the signal across the 3.1GHz to 10.6GHz range of the radio spectrum. UWB promises to deliver the same 480Mb/s connection speed as wired USB, thanks to the wide spread of frequencies that it uses. However, due to power restrictions put in place by the US Federal Communications Commission (FCC) it can only do so over short distances.

For actual implementation of the tech, the Multiband OFDM alliance has broken the spectrum down into the four chunks shown in the diagram. Initial devices will mainly use Group A, with Group C optional, while Group B and D are reserved for future uses.

The reason for this is the complexity of the CMOS chips driving UWB increases as the frequency increases. By focusing on Group A, the target of low cost devices is easier to achieve while still delivering enough bandwidth for the targeted uses of UWB communication.



ABOVE: The grouping system adpoted for the spread of usable UWB communication.

While the actual physics of the OFDM approach to UWB are hardcore, at heart it is simply a process of alternating frequencies. If we take Group A for example, the plan is to split the radio signal into chunks that are then distributed across the three frequency blocks. This is a similar technology to that used for ADSL, 802.11g and digital television broadcasts. The advantage over using a single narrowband frequency is that it minimises radio interference, while enabling higher transfer speeds than would be possible using a narrowband solution.

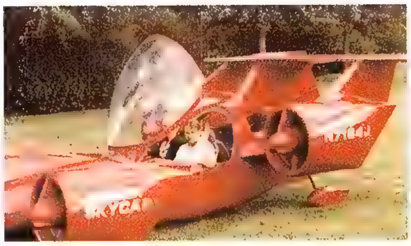
When compared to the finicky nature and low transfer speeds of Bluetooth, UWB seems a godsend, but it still does have limitations. Perhaps the biggest is that transfer speeds drop off exponentially with distance. It is for this very reason that UWB will be perfect for use as a PAN technology, however it does mean that it's unlikely that it will be shunted into atypical roles like Bluetooth was. UWB is all about getting rid of the wires that plague our lives; it is not a replacement for narrowband networking technologies like the 802.11 family. JG

ShortCircuits

When the Pentium 4 launched, it proudly bore a new architectural design – called Netburst – that was touted as having the headroom needed to take the Pentium name to 10GHz and beyond. Well that plan seems to have died alongside Intel's next scheduled core revision, codenamed Tejas, which the chip giant recently announced had been canned in favour of a dual core CPU that should launch sometime next year. The funny thing is that it looks like this dual core CPU will actually be based upon the Pentium M, which is based on the Pentium 3. At least we will always have Northwood as an example of Intel getting Netburst right.

US gaming PC builder Alienware recently announced that it plans to release dual graphics card systems by the end of this year. Called Video Array, the technology uses PCI Express and custom motherboards to get an extra 50 percent performance boost out of even the fastest systems on the market today. It does so by splitting the image into two halves and offloading each to one of the cards, with the final image being combined and output by a custom PCI card. While it is an Alienware specific technology for now, it uses the magic of PCI Express, which means that other manufacturers could possibly do it on a less proprietary scale.

NextFest, a technology exhibition held recently in San Francisco, was witness to inventor Paul Moller and his M400 flying car. Moller's 'SkyCar' (*pictured below*), a bright red vehicle complete with fans and futuristic bubble cockpit, contains a 770 horsepower engine and has a reported top speed of 365mp/h (587kp/h). According to sources, the airborne inventor has spent US$200 million constructing the stratosphere-bound sedan; however, he believes they could be sold for as cheaply as US$50,000, given the right circumstances. Despite the awesome George Jetson vibe, one has to question Moller's choice in colours.



Pincompatible

CPU sockets are again undergoing change, John Gillooly looks at the new Socket 939 and Socket T designs.

Sockets can be a politically hot issue for CPU manufacturers. The shift to a new socket means a cessation of upgrade paths, requiring users to add a new motherboard to any CPU purchase they consider. Stability of socket type was a big part of AMD's strategy with the Athlon CPU once the thunderbird core was released. AMD only made one model of Slot A Thunderbird. Since this point, all its 32-bit Athlons have used Socket A. The Athlon 64 has suffered from socket uncertainty since its launch, with normal Athlon 64 CPUs using a 754-pin socket and the Athlon 64 FX and Opteron CPUs using a 940-pin one.

On the Intel side it moved from Socket 370 for the Pentium 3 to a 423-pin socket for the Pentium 4. Unfortunately this lasted less than a year before it transitioned to a 473-pin one, which has remained the Pentium 4 mount for two years or so.

Both AMD and Intel are launching new sockets in June 2004, and they are markedly different beasts. But why bother changing sockets? The answer lies with power and functionality.

Socket to me

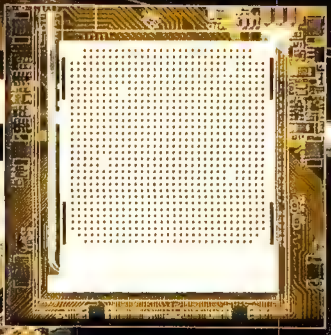
The socket on a motherboard is, not surprisingly, the main interface between the CPU and the rest of a PC. It is also the way that power is supplied to make the sucker work. The number of pins on a socket is not an arbitrary thing, although generally speaking the more pins the better. Like anything in this industry though, it's a trade-off between cost of production and benefits of more evenly distributed power, or increased processor functionality.

Perhaps the best example of this is the difference between the Athlon 64 and Athlon XP CPUs. Socket A, as used by the Athlon XP, has 462 pins, while the Athlon 64 uses a 754-pin socket. Both CPUs have similar power requirements but the addition of features like 64-bit support and integrated memory controllers in the Athlon 64 mean that more pins are required. The Opteron/Athlon 64 FX needs more pins again for multiprocessing support and the use of a dual channel memory controller.

While the Opteron will continue to use the 940-pin socket, the Athlon 64 FX and Athlon 64s will be transitioning to a single platform, with 939 pins. This is beneficial from both a simplicity perspective of having all 64-bit desktop processors on a single platform and from a practical perspective as it clears the way for potential moves towards dual memory controllers on the normal Athlon 64, and to finally rid the Athlon 64 FX of the need for registered DDR memory.

Motherboards such as the ASUS A8V that we have been playing with are set to appear on the market very soon. We have used it with an Athlon 64 3700+, but AMD has been very quiet about its new socket and so we were unable to track down a list of what other speeds will support socket 939 (we have seen 3500+ and 3800+ models as well). One good thing is that the socket works with existing Athlon 64 heatsinks. It's exciting from an upgrade path angle, but it is still the sort of socket that we know and love, based upon Pin Grid Array (PGA) packaging technology. Intel on the other hand is doing something very different with its new CPUs.

ABOVE: One of the evolutionary dead ends of the CPU sphere. AMD only released one Slot A thunderbird cored Athlon before shifting to Socket A.



RIGHT: The new home for the Athlon 64 and FX, the densely packed Socket 939.

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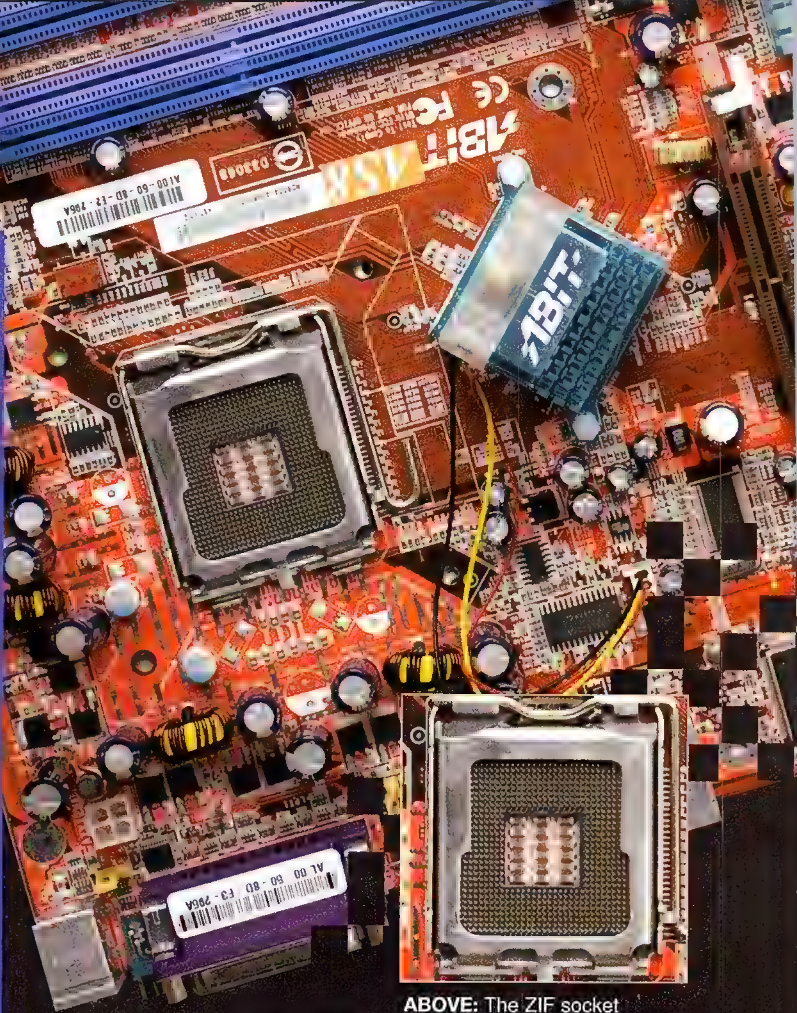

ABOVE: The ZIF socket successor. Socket T uses a metal clamp to hold the CPU.

The array has landed

Even though the CPU codenamed Tejas is officially dead, the new socket designed for it is very much alive, and will be ready to nestle with a Prescott near you very soon now. It is alternatively named Socket T and LGA775, and it almost literally turns the CPU world upside down in a way we haven't seen since the first flip chip packaging.

LGA stands for Land Grid Array, and it marks a move away from Pin Grid Array CPUs, much like a lot of high performance chips such as Gigabit Ethernet and GDDR memory have moved from PGA to Ball Grid Array (BGA) packages. LGA is designed to be more electrically efficient than PGA, as the CPU connects interfaces directly with the motherboard via spring laden pins. This means that LGA775 CPUs are pinless, and the sockets themselves have the pins. Freaked out yet? Well there are 775 spring loaded pins sitting inside a clamping metal housing that is designed to secure Intel's pinless wonder.

There are two big advantages that come from Intel adopting this technology; it makes CPU manufacture cheaper and it allows a higher density of pins than would otherwise be possible. Of course, shifting the complexity to the socket means that both the cost and worries about bent pins are then the responsibility of the motherboard manufacturers, which makes for slightly more expensive mobos. It also means that if bent pins happen, it means the whole motherboard will need to be sent for repairs, rather than just the CPU.

One of the big questions over the jump from 478 pins to 775 pins is just what the extra pins are for. Obviously the Prescott is a power hungry, heat pumping beast, so better power distribution is an obvious reason, but currently the hordes of conspiracy theorists have settled on two possible nefarious reasons. One is for the addition of Intel's 64-bit technology, which it has announced will be made available once Microsoft ships its 64-bit enabled version of Windows XP, and the other is that Intel is looking to shift the memory controller onto the CPU as AMD did. Both are complete speculation at the moment, but of the two, the 64-bit situation seems the most likely, as long as Microsoft actually releases 64-bit windows sometime this millennium.

Thanks to a combination of increased heat output and a new socket design, Socket T products will need new heatsinks, with a different mounting system to Socket 478. Socket T heatsinks sit over the mounted CPU and plug into the motherboard via four pushpins. Suffice to say, the upgrade path to Socket T is going to require a swathe of new hardware, especially seeing as while there will be some 865PE based Socket T boards, it will be mainly available with Intel's Grantsdale and Alderwood chipset, which will need a new PCI Express based video card as well.

Pinned

These changes in sockets mean that upgrades will require both a new motherboard and a new CPU, but they shouldn't change again in the foreseeable future. We do wonder what the future holds for Intel's Socket T; it was designed to accommodate Tejas, a CPU core that Intel recently canned in favour of a differently designed dual core solution that it will release next year.

This shifted architecture will most likely bring its own requirements for power and interface pins, which may indeed require a new socket. But we really do not know. Rumours are also emerging that late 2005 will mark the debut of a new 900-pin AMD socket to accomodate dual cored 90nm (nanometre) Athlon 64 CPUS.

We have not heard anything yet about where the future lies for these CPUs, which is a good thing seeing as usually sketchy details come out a good six months or more before change occurs (obviously manufacturers try to keep things quiet for fear of losing sales of CPUs that support the older socket type). For now though, the future lies in with Socket 939 and Socket T.

Thanks to ASUS (www.asus.com.au) for getting its A8V Socket 939 motherboard to us nice and early. And thanks to Altech (www.altech.com.au) for supplying the Socket T based ABIT AS8 mobo.

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HEADPHONES VS SPEAKERS

In the mood for a tune, eh? Whatever you might feel like groovin' to, you'll need the right sort of head gear. Or lounge gear. Dan Rutter tackles the musical magic of headphones and speakers.

Unless you've got RCA sockets hooked up to your auditory nerves, there are exactly two ways for you to listen to electrically reproduced music. Headphones or speakers.

Both are, fundamentally, the same. Electricity applied to a transducer – usually electromagnetic, occasionally piezoelectric or electrostatic – creates sound waves. Speakers have big transducers that run at power levels that are in the multi-watt range; headphones have little transducers that run on milliwatts.

There are other obvious differences between headphones and speakers. Speakers let lots of people listen, whether they want to listen or not; headphones keep the sonic fun to one person (well, more or less). Speakers cost more – possibly a *lot* more – for similar fidelity. Speakers are less portable. Speakers can jiggle your kidneys with pumping bass; headphones can't. And headphones can be uncomfortable – although the good ones aren't.

There's more to it than this, though. Headphones can actually mix it with speakers in more departments than you might think.

Two ears, eight speakers

Consider surround sound, for instance. If you've got 5.1 channels of audio (the 0.1 is the restricted-frequency-range subwoofer channel), then obviously five speakers and a sub, correctly set up, is the best way to reproduce it, right?

Well, that's certainly straightforward. Perfect speaker setup can take a while, but most people just plunk the things down and call the job done. Surround speakers also give a rigid audio frame of reference; while you're watching a surround sound movie, the sonic 'front' is always in the same place, even if you turn away from the screen. With headphones, the soundstage turns with your head.

But for some surround sound, particularly 3D positional computer audio, headphones can actually work *better* than speakers.

The reason for this is that you've only got two ears. The way you tell when a sound's in front, behind or above you, rather than just to your left or your right, is by processing the complex differences in phase, time delay and frequency balance that are imparted to differently located sounds by nearby objects (like walls), and by the sonic characteristics of your head.

Your pinnae – the outer parts of your ears – strongly influence sound waves that pass through and bounce off them. Three-dimensional game audio uses Head Related Transfer Function (HRTF) algorithms to *fake* the effects of the pinnae, the head and various listening environments, so that injecting the sound straight into the ear canal can produce the impression of real 3D audio sources.

When you've got HRTF-massaged two-channel audio already, for instance when you're playing a game, headphones are obviously the best way to get the sound into your head. There's no way for speakers to do the job as well, because there's no way for them to stop each ear hearing the sound that's intended for the other.

ABOVE: Wireless surround headphone systems don't tether you to your stereo.

Getting ordinary surround sources, for example DVD movies, into the right HRTF format for effective headphone listening, though, can be tricky.

If you're watching DVDs on your PC then you probably don't need to buy anything extra to get good surround through headphones. All of the most popular DVD playback programs these days have a software surround 'virtualiser' for headphone listening, and modern CPUs are more than up to the task.

If you want to translate any arbitrary surround source into headphone audio, though, you need extra hardware – a headphone amplifier with surround encoding functions. These days, some amps like that come with matching wireless headphones for easy living-room listening, but they aren't cheap.

ABOVE: Zalman. For when too many drivers aren't nearly enough.

Another way of encoding surround for headphones is to, well, not do it, and just buy headphones with multiple drivers. These 'phones are like a little surround speaker rig you wear on your head, fed by the separate surround channels (except for the subwoofer channel), with no HRTF wizardry needed.

Zalman's RS6F 'Theatre 6' headphones are probably the best known of this type among PC tweakers. They're cheap, too. The surround works well enough, but like most (if not all) multi-driver headphones, they don't actually *sound* very good.

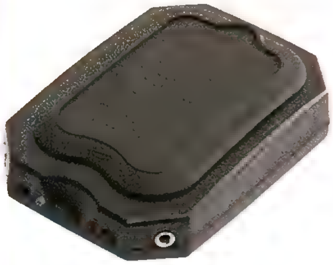
Crossfeed

The thing that makes speakers lousy for HRTF surround sound is also the thing that makes them good for music. Music is, almost always, mixed to sound good through stereo speakers. Thus, it's assumed that quite a lot of the left channel will be audible to your right ear, and vice versa.

Because headphones don't do this, music through them generally sounds as if it's all happening inside your skull. There's no stereo soundstage out there in front of you. For this reason, even very good headphones can become quite fatiguing to listen to, after a while. Generally, the more different the two stereo channels are, the more tiring it will be for you to listen to them for hours on end through headphones.

The solution to this problem is a relatively simple HRTF called 'crossfeed', which basically involves feeding an attenuated version of each channel to the other channel, and which makes headphones sound more like speakers.

Crossfeed that sounds really *good* goes on to slightly delay and frequency-tweak the crossfed sound, to imitate what the head does to sound from the opposite side of the room. The result is a soundstage that's apparently moved forward towards where it should be, with less extreme stereo-ality. Just like speakers.


ABOVE: HeadRoom's BitHead headphone amplifier (www.headphone.com) has everything that opens and shuts, including a crossfeed processor.

ABOVE: Closed-back headphones; the music-loving overclocker's friend.

Isolation

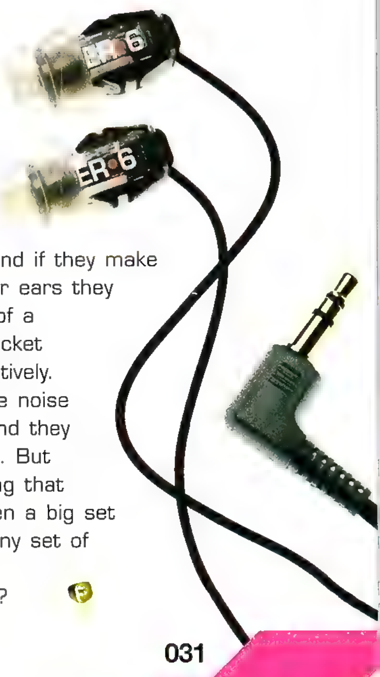
Speakers can only try to drown out ambient noise. Sealed headphones *block* it out.

Many of the best-sounding headphones are 'open', with a grille on the outside of the ear-cups that lets the rear pressure wave from the diaphragms out. Open headphones let through pretty much all ambient noise, which is good if you're expecting to be called for dinner but bad if you're on a bus.

Closed-back headphones make each ear-cup into a little sealed speaker box. They can sound great, too (and can easily be tuned for phat bass...), and if they make a decent seal around your ears they can block out the drone of a computer room or the racket of a LAN party very effectively.

Yes, you can get active noise cancelling headphones, and they generally work pretty well. But why bother with something that needs a AAA battery when a big set of sealed 'phones, or a tiny set of in-ear 'canalphones', will actually work just as well?

BELOW: Canalphones block outside noise like an earplug - because that's basically what they are.



Bass

Good headphones commonly have excellent bass response, but their teeny little drivers don't move bulk air like a big speaker. Your ears hear just as much bass as a speaker can deliver, but the rest of you remains unmoved.

ABOVE: There's no replacement for air displacement when it comes to bass...

For ordinary headphone listening, the lack of floorboard-shaking bass is a problem that can't be overcome.

If you're particularly dedicated, though, bolting one or more 'bass shakers' to your listening chair will give you the kidney-kicking effect of a giant subwoofer without much actual noise.

Bass shakers are mainly used in conjunction with subwoofers; the shakers cover the ultra-low frequencies mainly found in action movie soundtracks. But shakers can be used with headphones too.

ABOVE: ...but bass shakers can reach the parts *no* speaker can reach.

DATA INF
THE RISKS ARE SUFFICIENTLY HIGH TO WARRANT PEOPLE TAKING SENSIBLE PRECAUTIONS

HOT CHIPS WITH SWEET CHILLY SAUCE

Dissecting the evils of heat, Nathan Davis equips his flux capacitor, routes a heat pipe and takes a peek at what's ahead for cooling.

Where microprocessors are concerned, heat is a mischievous imp. It holds back the ability for microprocessors – generally dubbed 'chips' – to run faster or properly process data and it tends to severely rock the overall stability of your system. Which is by no degree good.

This heat can't really be used either, unless you have a cuisine inspired mod (now there's an idea…), so a drop in temperature is required. Changing the temperature from hot to cold isn't the easiest thing to do but over time the methods have matured. Which is a damn good thing and we'll talk about what sweet cooling you can look forward to in a jiffy.

ABOVE: Is it a duck? No it's electromigration – circuitry changing shape due to the movement of conductor atoms.

Electromigration

Electromigration is minute circuitry playing silly buggers and rearranging itself into an unusable or under-performing state, as a result of moving conductor atoms (ions) in the circuitry. Yep, metal that moves around. Cool, eh?

The reason behind this still isn't completely understood, but what's commonly accepted is that it's the outcome of electron movement – the transferring of momentum from the electrons to the ions that make up the tracery, or microcircuitry. When conducted through a metal, the electrons meet with blemishes in the circuitry and eventually cause the conductor atoms to scatter, building up an accumulation in the direction of the electron movement and eventually leaving behind nothing but space (known as a 'void'). This non-conductive space, unsurprisingly, is not a great thing. The scattering comes about as a result of an atom being in the wrong place. So, it's only fair that it gets a spanking.

As heat is made up of vibrating atoms, the more heat there is, the more atoms are going to be in the wrong place at a particular time and this increases the rate of scattering and resistivity. Consequently, this is technically why heat is the source of resistance – vibrating atoms, that is.

Take a look at the enlarged electromigration example above. Those nasty large bulges are what are known as a hillocks and as you can see, the metal is building up and creating a large deposit of metal. These happen because the traces are so incredibly tiny – about 60 nanometres – and as a result, the electrons have even more effect on the minute traces. This ended up creating some exceptionally large hillocks, such as seen on this nasty blighter.

This build up makes the metal atoms separate and create a void large enough that electrons can no longer reliably, if at all, cross. This is the final stage of electromigration, and as you might have guessed, electrons can no longer move around a great deal.

Seeing as alive and working components are slightly more useful than dead ones, this is why we like to keep things chilly. Electromigration is the devil.

Argh, my heated core

But first, have you ever stopped and asked yourself 'why is heat so bad?' This is the simplest and, as it may seem, perhaps the dumbest question relating to heat. But it's not stupid. Sure, to chips, heat is the quintessence of Hell's heaters, but apart from the obvious unfavourable effects it has on a system, what exactly does heat do technically to hinder a chip's performance?

Well let's skip back a little in the food chain and see where the heat comes from. In short, it's the resistance in a chip's circuitry which generates the high temperature that needs to be removed.

In longer, it comes down to what the minute circuitry in chips is made of – metals, or conductors. The major issue with conductor-lined chips is the power resistance levels. If you bump up the heat, the higher temperatures, in turn, amplify the resistance levels of these nanoscopic lines of metal. It then becomes a fight for equilibrium in a disproportionate manner because, as a result of the higher resistance, more power is dissipated over the chip. Alas, as a climatic, grand result, this creates more heat.

Now, we're reasonably certain we mentioned that more heat increases the resistance...

A certain amount of resistance is expected – much is due to imperfections in the conductors or traces – but as you can see, heat creates a vicious cycle, with resistance creating higher temperatures and the bonus heat increasing the resistance.

When the resistance jumps up, higher levels of voltage are lost over the resistor and very little current manages to pass through. Consequently, less voltage and current are being delivered to other components further down the line, causing *strange things to happen*, as the voltage or current (both, even) is so immeasurably low (or non-existent if the resistance is high enough) that these components are on the brink of 'I can't trigger on, captain'.

When they reach their peak, whammo, you have yourself a non-functioning processor, as the resistance is far too high. 'VIVE LA RESISTANCE', only the French mutineers are electrons.

If left long enough, this heat and its effects can cause serious damage, which is why measures are put in place to stop it from happening, such as auto shutdown if the processor hits a certain temperature.

And this would *probably* explain why cooling was invented.

So bringing us down to the bare facts, the heat induces a relative resistance change, and as a result can eliminate the processing chip from doing anything other than sitting there in a state of suspended unconsciousness. Aside from the more immediate and obvious implications of heat (like, say, instant meltdown), high temperatures also intensify long term problems such as oxide breakdown and the intriguing phenomenon of electromigration (*see boxout at left*).

Come again?

Cooling methods have evolved over the years, but up until recently the focus had primarily been on only removing the heat. *Only.* That's a bad thing for only one reason – ear pulsating noise. You know, like that Lear 'FOP38' Jet engine you used to have screaming in your – as a result – *much* feared case.

And sure, you can shove in a farm of 40 arrayed fans with matching heatsinks, but aside from igniting the phear factor and sucking loads of juice, it's simply not practical. Theoretically, if you have enough fans you'll end up heating the air significantly due to fast colliding air molecules, thus increasing the ambient temperature via friction. And then there's the heat from the fan motors...

It's almost hard to believe blaring fans such as the FOP38 used to be the requirement for many CPUs, particularly if you were to even think of overclocking. Luckily, the focus has shifted to quieter – even silent – and actually useable systems.

Recycled air, it's *the* shit

Though shrinking in die size, chips are just rocketing in speed and heat. Serious cooling will be required – whack 'more intelligent cooling manufacturers' on that list, too. Why? Time to spill some steaming blood.

Manufacturers seem to be slightly warped by their reading of 'Watery Ways to Fruck Systems Right Up: The Pretty Way'.

They've seemingly forgotten the primary reason for water cooling – superior performance in all areas when compared to heatsink/fan combos. As in *cooler* and *quieter*.

Seeing as their lust for heating the very water that supposedly cools your chips is showing no signs of cooling off (unintentional pun, honest), designs such as internal radiators and the like are here to stay – until we complain.

Well, we're complaining.

For the uninformed, especially certain unnamed manufacturers, recycled air is not a good thing for any form of cooling. Recycled air heats up. Heated recycled air cannot possibly make anything cooler than its own temperature, which is warm. The water is thermally affected by said heated air. Figures…

Unless both the air intake and exhaust have direct access to cool air, the system will most likely perform well under par. In far too many situations, it has come to the point where water cooling just isn't worth all the tubular messing around.

Oh, and the noise!

Some water coolers are so blatantly loud, with pump and of all things the *fan* noise, there's absolutely no point in having them, bar an unhealthy addiction to keeping your ears full of thunderous ambient sounds. And they go against the very reason for having a water setup – no noisy fans.

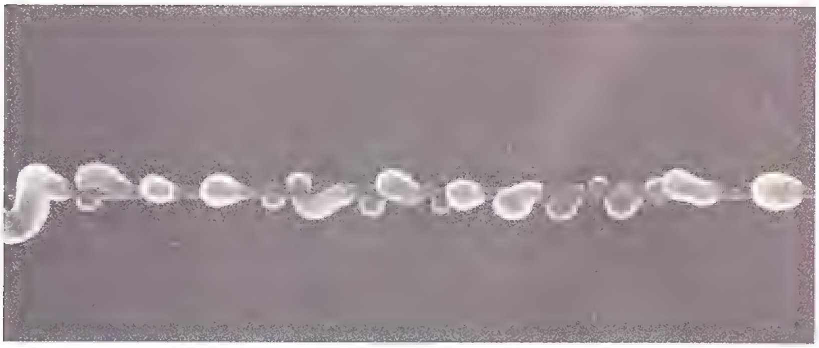
Seeing as the majority of these whining bastards hardly come close to cooling as well as a significantly quieter and overall, superior, heatsink/fan combo the question begs – why?

There is no reason.

This is why many cooling systems perform horrifically. Some merely suck the spooge out of cannon balls.

There's no doubting there are some damn incredible water cooling setups out there, but the market has been flooded with drivel. Which is bad. We don't appreciate that.

But in the near future, the cooling we may call hardcore now will be a necessity. Not tubed water cooling (well, not as you know it anyway) either – that's just not hardcore anymore. Water cooling is mass-market. So, let's explore what's ahead.



ABOVE: Here is a chain of hillocks. This isn't where you start worrying – that should've already been done by the time it reaches this stage.

Chilling out in the future

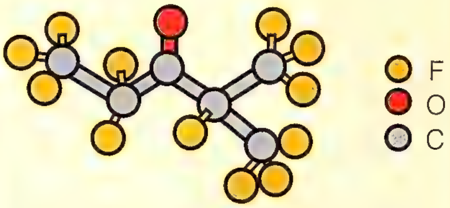
With the fast escalation of heat in processors and the need to overclock, the hardcore enthusiasts among us have used systems which involve designs such as peltiers and other refrigeration techniques, thermoelectric designs and, of course, nitrogen in its liquid state.

The easiest and the most useful out of those would have to be refrigeration, as thermoelectric is a very tricky design to have to set up correctly and liquid nitrogen, apart from being dangerous, is very expensive and requires continual refilling. However, all of these systems gather a collection of condensation around the chips they are cooling, requiring proper insulation and constant checking.

The majority of tomorrow's designs are far different to these. Most cooling technologies are moving towards nano-sized. Take microchannel water cooling, for example. This cooling method uses miniscule channels about three times the width of a human hair and, believe it or not, it doesn't use a pump. This is possible because microchannel systems have an entirely closed circuit in which the water flows in a continuous loop. It does so cleverly using the power of heat. Containing a non-conductive liquid (possibly Novec 1230), as it reaches the heated processor, it begins to boil and creates bubbles. The bubbles then rise up the chain and are cooled in a radiator by a fan, where the bubbles recondense into liquid which heads back to the processor in an infinite loop. Shrinking the diameter of the channels, of course, creates even

Liquid sapphire, rockin'

Recently there was a demonstration of a substance that puts fires out without damaging anything and both looks and feels like water, but isn't. And it doesn't get anything it comes in contact with 'wet', as such. 'Sapphire', as it was introduced, is a completely non-conductive liquid chemical (also comes in a gaseous state).



ABOVE: Sapphire / Novec 1230 with a chemical structure $CF_3CF_2C(O)CF(CF_3)_2$.

Sapphire has actually been around for a couple of years and, technically speaking, this chemical's official name is Novec 1230.
Its boiling point is 49.2°C, and yep, processors tend to reach that quite easily, but as it can turn into a gas faster than other liquids, this may turn out to be rather useful. Of course, even though Novec 1230 is used to put fires out, it doesn't necessarily mean it'll handle cooling a CPU. Full immersion cooling is a possibility. And it is always possible Novec 1230's two states could be taken advantage of and used in a similar way to heatpipes, only with superior heat transference. That is, as long as the gas can be recondensed to a liquid form and the boiling doesn't damage its chemical make-up.
Naturally, it's being pushed as a substance for putting out fires without damaging anything – however, being non-conductive, it has major potential in the cooling of electrics. The only possible problem we can see is avoiding the condensation it could potentially create. The prospect of using it for total immersion cooling is right up there, though it may turn out to be rather expensive. If you're interested in its specs, check out this paper: www.yorbamicro.com/stuff/Sapphire-Novec1230-FAQ.pdf.

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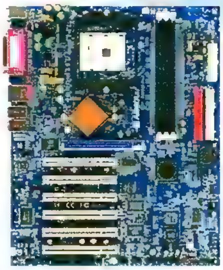

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smaller bubbles that results in better performance, which, according to surprised researchers, is not what was expected. They originally thought the bubbles would in fact block off the flow of water.

Then there's another method that really tickles our fancy, and that's another form of micro cooling. Instead of using water, it goes back to the basics of using air, however the method of creating a breeze is what really stands out.

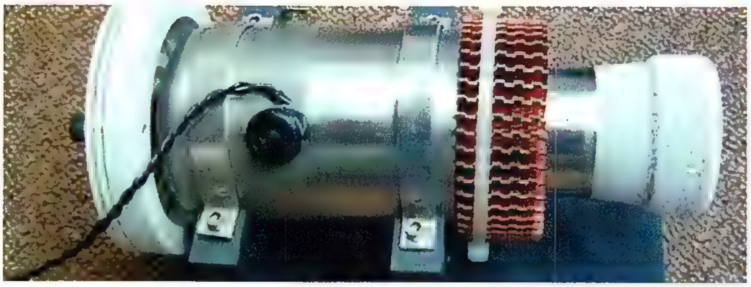
Using carbon nanotubes – yes, the very things foreseen to be used on 'space elevators' (www.spaceelevator.com) – and the power of charged atoms – ions – you have yourself, first, a miniature lightning show, but also a breeze, which can go up to speeds of 32km/h.

Basically negatively charged carbon nanotubes discharge electrons toward the positively charged nanotubes and the surrounding air molecules are ionised, hence the lightning bolts. These ions are then created and can be attracted to the opposite side by electrodes, and then vice-versa, very quickly. This back and forth motion of moving ions creates a cooling breeze. Electrifying…

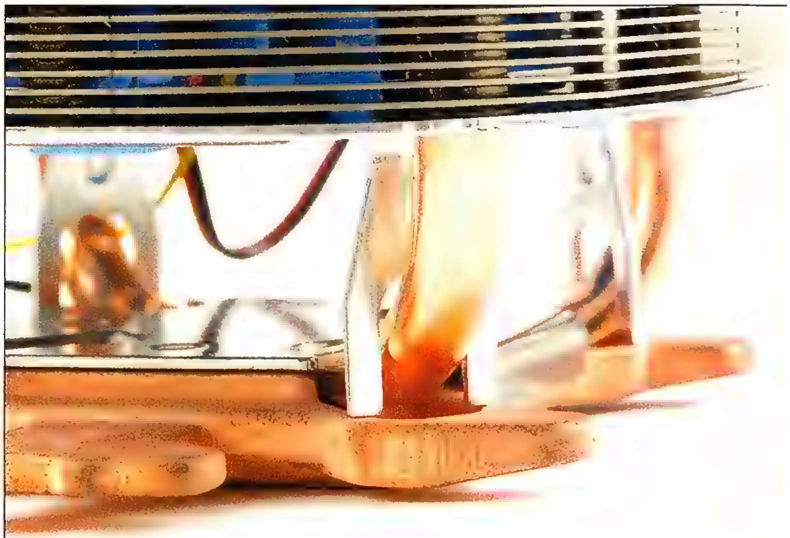
Stirling Cycle cooling is a concept that's a cross between standard refrigeration and liquid nitrogen, only it's cooler (in both senses of the word) as it uses helium instead.

There are basically no moving parts, except for the piston, to compress the helium and a displacer which relocates the gas to where the heat is dissipated. It also reduces the power consumption rate by truckloads when compared to refrigeration systems (which usually require an external power source – as do thermoelectric systems). There's even a recent prototype from Global Cooling (www.globalcooling.nl) operating on a crazily low 9W.

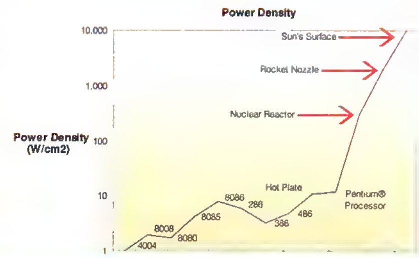
By the time we reach the need to cool rocket nozzles, we'll probably have to use things like Adiabatic Demagnetization Refrigerators. However, it goes without saying, the future of cooling is creating even more new technologies and overall it's looking damn freezing on a smaller, quieter scale.



ABOVE: This is what a recent Global Cooling prototype Stirling Cycle cooler looked like.



ABOVE: Heatpipes have been a brilliant upgrade for the humble heatsink. By using the superior heat transferring properties of a volatile liquid such as water, relocating the heat to the fins, for example, is much faster and the performance is greatly increased. Whack some Novec 1230 in there (see '*Liquid sapphire, rockin*' boxout) and just maybe it'll be even better.



Rocketing up the charts

A tootin' good reason for the need of fast evolution of CPU cooling is that processors are fast escalating in wattage output. Some of you may have heard about Pat Gelsinger from Intel's infamous Power Density chart (which was used many-a-time). If not, this is where he compares the current heat on Pentium processors against nuclear reactors and rocket nozzles (that's the chart above) – stating that's where computers are headed. Well blow me to Pluto, that is intense thermal emission.

During one of his speeches in 2002 (yep, he used this chart there too), Gelsinger stated how Intel, at least, is on track and sticking to Moore's Law, '...by 2010 [Intel will have] 30GHz devices, 10 nanometer[s] or less delivering a terra instruction of performance.' He went on to talk about the tenfold increments that processor watts are increasing by – from 100 to 1,000 to 10,000 watts per square centimetre.

Apart from the damn neat thought of owning your very own 30GHz mofo of a beast, 1,000W is an insane wad of power per square centimetre (let alone 10,000W). That, right there, would qualify as more than a few good reasons for a hardcore cooling solution other than air. Unless you literally use a Lear Jet engine with some sort of noise cancellation, but you just may find it a tad on the hungry side for miscellaneous objects.

You can read the superbly long transcript of Gelsinger's speech here:

www.intel.com/pressroom/archive/speeches/gelsinger20020228.htm

Electromigration sources

www.csl.mete.metu.edu.tr/Electromigration/emig.htm
www.uwo.ca/isw/facilities/positron/ICW.html

Thanks to Xun Pang and Gary H. Bernstein, University of Notre Dame, for providing the wonderful electromigration imagery.

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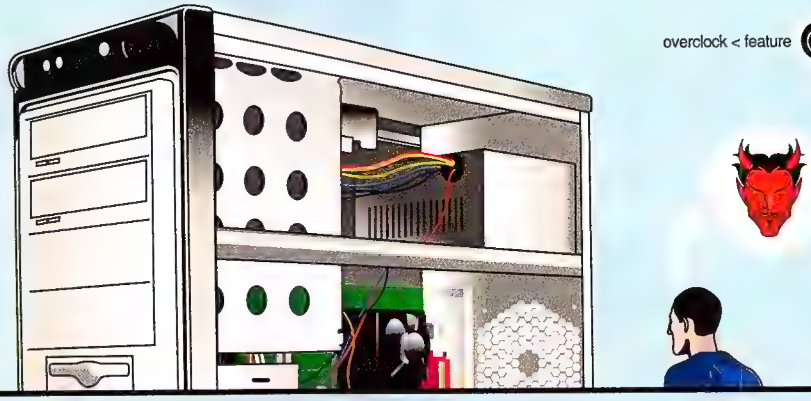
If you decide to use any of the methods described in this guide, you do so at your own risk. If you damage or otherwise render inoperable (or partially operable) any of your components, chances are you'll have to buy new ones. So, if you can't afford to lose something, then don't overclock it!



Overclock

part 2

Welcome to Part 2 of our overclocking guide by Chris 'DonutKing' Byrne. This month we will look at specific overclocking techniques for the Athlon XP/Duron, Intel Celeron/Pentium 4, and the brand new Athlon 64/FX/Opteron CPUs.

Intel Pentium 4 and Celeron overclocking

Until the Northwood core, the Pentium 4 was not seen as an ideal option for tweakers. The Northwood changed all that, overclocking like a demon and giving the Athlon XP a run for its money. Although it is impossible to unlock a Pentium 4's multiplier – so you're limited to FSB overclock only – the Northwood and Prescott are impressive overclockers. Note that Pentium 4s have a quad-pumped FSB – so a CPU advertised as 800MHz FSB is actually running at 200MHz FSB (200 x 4 = 800). 400MHz and 533MHz FSB processors run off a 100MHz and 133MHz bus respectively.

There are three cores of the Pentium 4 (If you are unsure of what core you have, download CPU-Z from www.cpuid.com/cpuz.php to check).

- Willamette (the original core), which was quite warm, performed poorly and didn't overclock well;
- The Northwood core, which was cooler, had double the L2 cache of the Willamette, and overclocked and performed much better; and
- The brand new Prescott core which also overclocks well, has double the L2 cache of the Northwood but runs very warm.

Celerons are crippled Pentium 4s with half the L2 cache. Currently, these are Northwood-based but Prescott-based Celerons may soon become available. They behave similarly to a Pentium 4 when overclocking – however they will always be relatively slow regardless of clockspeed.

P4 quirks

The first item for discussion is SNDS or 'Sudden Northwood Death Syndrome'. Northwood Pentium 4s don't like voltages in excess of 1.75V. At these voltages Northwoods will often die quickly. It is currently unknown if the Prescott has this problem, but it's better to be safe than sorry. So if you have a Northwood or Prescott be careful with the juice.

Also of note is that RAM bandwidth is very important with Pentium 4s. Normally with Athlons, running the RAM at a divider like 4:5, which runs the RAM faster than the FSB, doesn't give much extra performance. But on the P4 this makes a big difference. This is because the P4 has a high effective FSB (800MHz for recent models) and DDR doesn't give anywhere near this effective bandwidth. Dual channel RAM alleviates this problem. If you run two DDR400 modules in Dual Channel at 1:1 ratio you get effectively 800MHz – matching the CPU's effective FSB. Dual Channel is only available on some motherboards, but nearly all recent ones support it.

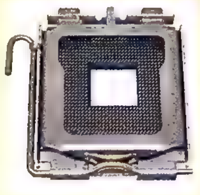
Performance Acceleration Technology (PAT)

The i875P chipset has Performance Acceleration Technology, or PAT. This gives a small speed boost due to some optimisations for lower latency. It is officially only available in the i875P chipset with an 800MHz FSB processor and RAM at 1:1 ratio in dual channel mode. Some i875P motherboards may not boot if you overclock beyond 200MHz FSB and have PAT enabled – you may have to disable PAT in these circumstances.

It is possible to convert early revisions of the i865PE into a cut down i875P (with enabled PAT, without ECC Memory support) with a BIOS flash. In fact many manufacturers advertised this feature and shipped the BIOS with their boards. This wasn't called PAT due to licensing issues (for example, ABIT called its version Game Accelerator) but was essentially the same. It seemed that pseudo-PAT got disabled once you overclocked these i865PE boards – rather than not booting it simply reverted back to non-PAT performance. An overclocked i875P with PAT disabled still ran slightly faster than a similarly clocked i865PE with PAT enabled. Intel has recently locked PAT support out of the i865 series chipsets so this is no longer an option.

The new Prescott core

The Prescott is a new core design for the P4. Among other things, the L1 and L2 cache have been doubled from the Northwood, and the core has been redesigned to reach higher clockspeeds. Currently it's not very exciting – slower performance at stock speeds than a similar Northwood, using more power and running hotter as well. Some websites have reported the Prescott *melting* the motherboard's socket when heavily overclocked! When it is overclocked, the Prescott scales better – it gets faster with more MHz than a Northwood. If you can keep it cool you are in for some very good performance. Prescotts are sold as P4 Es (not to be confused with EE which is a Northwood extreme edition, with 2MB L3 cache – these perform well but are expensive). It might be worth waiting before getting a Prescott because Intel will soon release a radical new socket called LGA 775. Supposedly this new design allows for better cooling and signal quality, and may bring other advantages as well.



ABOVE: Intel's new Socket T, which has pins mounted into the socket rather than on the CPU (see *page 26* for the lowdown). This is expected to give the Pentium 4 a formidable boost.

AMD Athlon/XP/Duron overclocking

AMD has arguably been more popular in the past with overclockers (at least until the arrival of the Northwood P4). One of the main reasons for this was

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P4C800-E Deluxe

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Serial ATA + ATA133 RAID 0, 1, 0+1
Intel Performance Acceleration Technology
Ai Audio, Ai BIOS, Ai Overclocking, Ai Net

For Enthusiasts

P4P800-E Deluxe

Intel Pentium 4/Celeron up to 3.2 GHz+
Intel 865PE/ICH5R chipset
800/533/400 MHz system bus
Dual channel DDR400 memory
ASUS Hyper Path Technology

Marvell 88E8001 Gigabit LAN
IEEE 1394
Serial ATA + ATA133 RAID 0, 1, 0+1
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the possibility to unlock the multiplier on some AMD CPUs. The CPUs and motherboards are sometimes cheaper as well. AMD CPUs run off a double-pumped bus – so 133MHz FSB in the BIOS equates to 266MHz effective speed.

There are four main cores of the Socket A Athlon. Again, you can go to www.cpuid.com/cpuz.php and download CPU-Z to check what core you have from the following:

- Thunderbird, the original Socket A Athlon core (not Athlon XPs);
- Palomino, the original Athlon XP core, which ran slightly cooler than Thunderbirds;
- Thoroughbred, the second Athlon XP core which came in two variants: A and B. There is no performance difference between these two cores, but Thoroughbred Bs could reach higher clockspeeds because the core was redesigned for extra stability, and
- Barton, which is basically a Thoroughbred with an extra 256KB of L2 cache. Some Bartons were downgraded to Thortons – which had half the cache disabled, making them functionally identical to the Thoroughbred Bs, however the extra cache can sometimes be re-enabled (*see below*).

Unlocking the multiplier

Some AMD CPUs allow you to unlock the multiplier. Normally the multiplier is locked and you must overclock via FSB only – you can change the multiplier in the BIOS on a locked CPU, but the system will not boot. You had to perform a 'bridge mod' to unlock the other multipliers. Bridge modding involves removing the HSF, changing small metal bridges (basically binary switches) on the surface of the CPU and reinstalling the HSF. It is easy to damage your CPU by doing this, so perform these mods at your own risk. Check that your motherboard supports multiplier adjustments before doing these mods (most recent ones do).

Thunderbird cores could be unlocked simply by using a pencil to join the 'L1' bridges. Look here for details: www.motherboards.org/articlesd/how-to-guides/41_1.html. Note that some of the very last Thunderbirds were unlocked from the factory – check that your CPU is unlocked before doing any mods as they may be unnecessary.

Palomino cores made things difficult with the addition of a laser-cut trench between the L1 bridges. These require more effort to unlock – you must fill the trench with something non-conductive then close the bridges with something conductive, as shown at http://www6.tomshardware.com/howto/20011112 index.html.

Note that some Palomino 2100+ CPUs required a special unlocking method – surf over to www.pcstats.com/articleview.cfm?articleID=1009 for details.

A lot of Thoroughbreds were unlocked from the factory. If the CPU was locked, some motherboards could automatically unlock them. Most nForce2 based motherboards and some VIA KT400 based motherboards had this ability. Bartons and Thortons are based on the Thoroughbred core, so these motherboards can also unlock these cores.

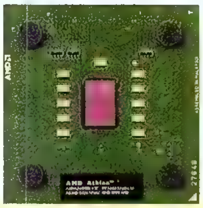
If you have a locked Thoroughbred, Barton or Thorton based CPU and don't have a motherboard that will unlock it, you can do so by joining two pins on the back of the CPU or the mobo's socket. See here for details: www.lostcircuits.com/cpu/amd_unlock Of course, you can also do the conventional bridge mod: www.overclockers.com.au/article.php?id=118669.

One problem that can arise is that if you have an unlocked CPU, and its default multiplier is below 12.5, then you will only be able to select multipliers below 12.5 in the BIOS. If your default multiplier is above 12.5 then you will be limited to multipliers above 12.5 only. The ABIT NF7 series motherboards have a '5-bit FID' feature which gets around this limitation and allows the full range of multipliers to be selected for an unlocked CPU. Otherwise, the only way to get access to the other range of multipliers is to mod the last 'L3' bridge on the CPU – which follows the same procedure as unlocking it (*see above*).

Superlocked Athlons

Lately, AMD has followed Intel's lead and totally locked the multiplier on its CPUs. Contrary to popular belief, this didn't begin in week 39 last year. There have been reports of cores that were manufactured both before week 39 that were 'superlocked' and after week 39 that were unlocked. CPUs bought brand new these days are almost always superlocked – you will be limited to FSB overclocking only. Plus, all new AMD CPUs have a new green substrate with a thick layer of a varnish-like stuff on top which can hinder bridge modding efforts. There is info on bridge modding CPUs with this new packaging at www.ocprices.com/?rev_id=184.

What is all this 'week 39' talk about? The year and week that each CPU was made is printed on the CPU. For a Thoroughbred/Barton, this is on a black sticker, on the top of the CPU but off to the side below the core. Earlier cores like the Palomino or TBird had this printed on the actual CPU core itself.



ABOVE: The new packaging for the Athlon XP can hinder unlocking and other modding efforts.

On the second line of this sticker is a five-letter code – this is the CPU stepping code. Some steppings are better overclockers than others. After this code should be four numbers, eg: 0339. This shows the year and the week the CPU was made. The first two letters are the year and the second two are the week. In the above example, 0339 means week 39, 2003. The odds are that this CPU is superlocked. If you are buying a second hand CPU, check this code and try and get one as early as possible to minimise the chances that it will be superlocked. This doesn't guarantee that you will get an unlocked CPU though – some cores as early as 0331 are reported to be superlocked.

There is *one* way to defeat the superlock, but it's difficult. You can turn your CPU into an Athlon XP Mobile. These chips are used in laptops and have PowerNow technology, which allows the multiplier to be changed dynamically to save power. Of course, this means the multiplier must be unlocked...

This method involves bridge modding, and the multiplier can't be changed in the BIOS like normal – you have to use a program through Windows to do it. This currently doesn't work with the nForce2 chipset, and many motherboards require some additional software hacking before it will work. If you're still interested, look here for info: www.ocworkbench.com/2004/guides/unlockbartonwk43/unlockbartonwk43-1.htm.

Speaking of the XP-Mobile, these are available in Socket A form and will run in most recent motherboards. They are fairly rare but they overclock extremely well – the 2400+ defaults at 1.8GHz and can get close to 1GHz overclocks with extra voltage and cooling. These chips are hand picked Bartons with PowerNow technology, with 1.45V default voltage and they are fully unlocked – you don't even need to use software to change the multiplier, it can be done through the BIOS. They are great CPUs and run fairly cool as well, so if you happen to find one, grab it.

Duron and Thorton L2 cache mods

Let's not forget the Duron. There are a few types of Duron cores: the Spitfire (based on the Thunderbird); the Morgan (based on the Palomino) and the Applebred (The core used today, based on the Thoroughbred). They behave in a similar way to normal Athlons when overclocking.

The Applebreds can be made into Thoroughbreds by a bridge mod – normally they have only 64KB of L2 cache, but this mod unlocks the full 256KB L2 cache that the Athlons have! See www.xbitlabs.com/news/cpu/display/20030908004407.html for details. This is risky as sometimes the extra cache was disabled because it was faulty, although many people are reporting success with this mod. Just remember that this might not work and you may need to undo your modifications.

It is also possible to do a similar mod with Thorton core Athlons. The Thorton core is actually a Barton with half the L2 cache disabled to give 256KB (The same as a Palomino/Thoroughbred). Like the Duron, you can sometimes unlock the extra cache. Details are available at: www.xbitlabs.com/news/cpu/display/20030930171549.html.

AMD Athlon 64 overclocking

The latest buzzwords in the AMD world are the Athlon 64, the Athlon FX, and the high end variant, the Opteron. They are the first mass consumer oriented 64-bit desktop CPUs. These CPUs perform amazingly well for their relatively low clockspeeds – and they perform even better when overclocked. We will focus on the Athlon 64 rather than FX or Opteron as the latter two are not easily available.

First, it is wise to flash to the latest BIOS before overclocking. Since it's a new platform, there are still some bugs to be ironed out. Additionally, there have been issues where overclocking some motherboards can cause a corrupted BIOS on boot. Therefore it is recommended that you leave the CPU's settings at stock in the BIOS and use Clockgen (discussed in last month's article, and can be downloaded from www.cpuid.com/clockgen.php) to change them from within Windows. Using software overclocking will cause the system to boot up at default speeds, and overclock once Windows has booted, thus avoiding the corrupt BIOS on boot problem. Until these issues are fixed, this is the safest option.

HTT and HyperTransport

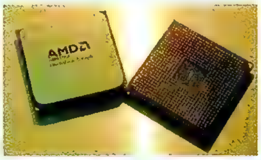
Athlon 64 CPUs have an integrated memory controller, so FSB as such doesn't really exist – the equivalent is called HTT. This will usually default to 200MHz and is multiplied by the LDT setting in the BIOS, to get the HyperTransport frequency. The max HyperTransport frequency is dependent on your motherboard chipset.

The important thing is that if HTT x LDT ever exceeds the motherboard's maximum, the system will restart at a safe frequency (ie: underclock itself). So you should go into the BIOS and reduce the LDT setting – just low enough so that the HyperTransport frequency will never exceed the motherboard's max. If you set the LDT too low you can get stability issues – therefore, the HyperTransport frequency should be as close as possible to the motherboard's maximum.

Multiplier and AGP/PCI bus locks

The A64 series is partially unlocked. You can use multipliers lower than stock, but not higher. This means that you can get the HTT speed pretty high without worrying about the CPU speed maxing out. However, the HTT speed is usually held back by your RAM, and the HTT and CPU often have a lot of headroom left when the RAM hits the ceiling.

Additionally, the AGP/PCI lock on some motherboards seems to be broken at certain HTT speeds. There is an option in the BIOS to lock the AGP speed at 66MHz (and thus lock PCI at 33MHz) but this doesn't seem to always be functional. For example, on some nForce3 boards, at 200MHz HTT on boot the AGP/PCI lock won't be engaged, but the PCI speed will still be at 33MHz. If you overclock the HTT in Windows using Clockgen, the PCI bus speed will increase because it isn't locked. However, if you set the BIOS to 201MHz HTT it appears that the lock *does* function, and if you overclock the HTT from within Windows, the PCI bus will remain at 33MHz. It would be wise to check your PCI bus is locked at 33MHz by making a small (eg: 5MHz) HTT overclock and checking the PCI speed, before knocking the HTT up any significant amount.



ABOVE: One of the new Socket 754 Athlon 64 CPUs. Note the heatspreader – this will make installing HSFs on the A64 a much less harrowing experience than previous AMD CPUs.

RAM and the Athlon 64

Memory dividers are also different on the A64. Because the CPU has an integrated memory controller, the RAM speed is calculated from a divider of CPU speed. CPU speed is the multiplier times the HTT. In the BIOS you will have a setting called Max Memclock or FSB:DRAM ratio which sets the memory dividers – see the RAM section last month for details.

The thing is that RAM frequency is actually a divider of the CPU core clockspeed – because of the integrated memory controller. A divider will be selected that will give a RAM frequency of under or equal to the target frequency- but never over. For example, at HTT of 250MHz with a multiplier of 8.5 will give a CPU core speed of 2125MHz. As an example, at 3:2 ratio at 250MHz – a target frequency of 166MHz – the closest divider of 2125 that will give us as close to 166MHz but not over is 13. This only gives a RAM frequency of 163MHz. As you can see, RAM dividers can get confusing.

RAM latencies also have a huge impact on performance on the A64. For example, tRAS (Active Precharge time) can be worth as much as 10MHz in HTT speed. Another quirk is that some motherboards are unstable when overclocking using two or more RAM modules. If you have stability issues when overclocking, try removing one module and see if it helps. Finally, if you have instability at high HTT speeds try increasing the LDT voltage. You may need to increase the VCore and VDimm to reach your maximum overclock.

Bibliography & Helpful Links:

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Unlocking [Thunderbird/Spitfire core] Durons and Athlons Using a Pencil by Elric Phares
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AMD AthlonXP Thoroughbred Unlocking [Bridge Modding] by Herro
www.overclockers.com.au/article.php?id=118669
New style AMD CPU Packaging Part II [Bridge Modding] by Ben Williams
www.ocprices.com/?rev_id=184
Unlocking a week 39 or later AMD CPU [aka Superlocked Athlons] by Eversor
www.ocworkbench.com/2004/guides/unlockbartonwk43/unlockbartonwk43-1.htm
IS7 vs. IC7: The true story, stock vs. overclocked [i865PE vs i875P] by Zroc
www.hardforum.com/showthread.php?s=0cbb78f479793fca53970efd86602493&threadid=625552

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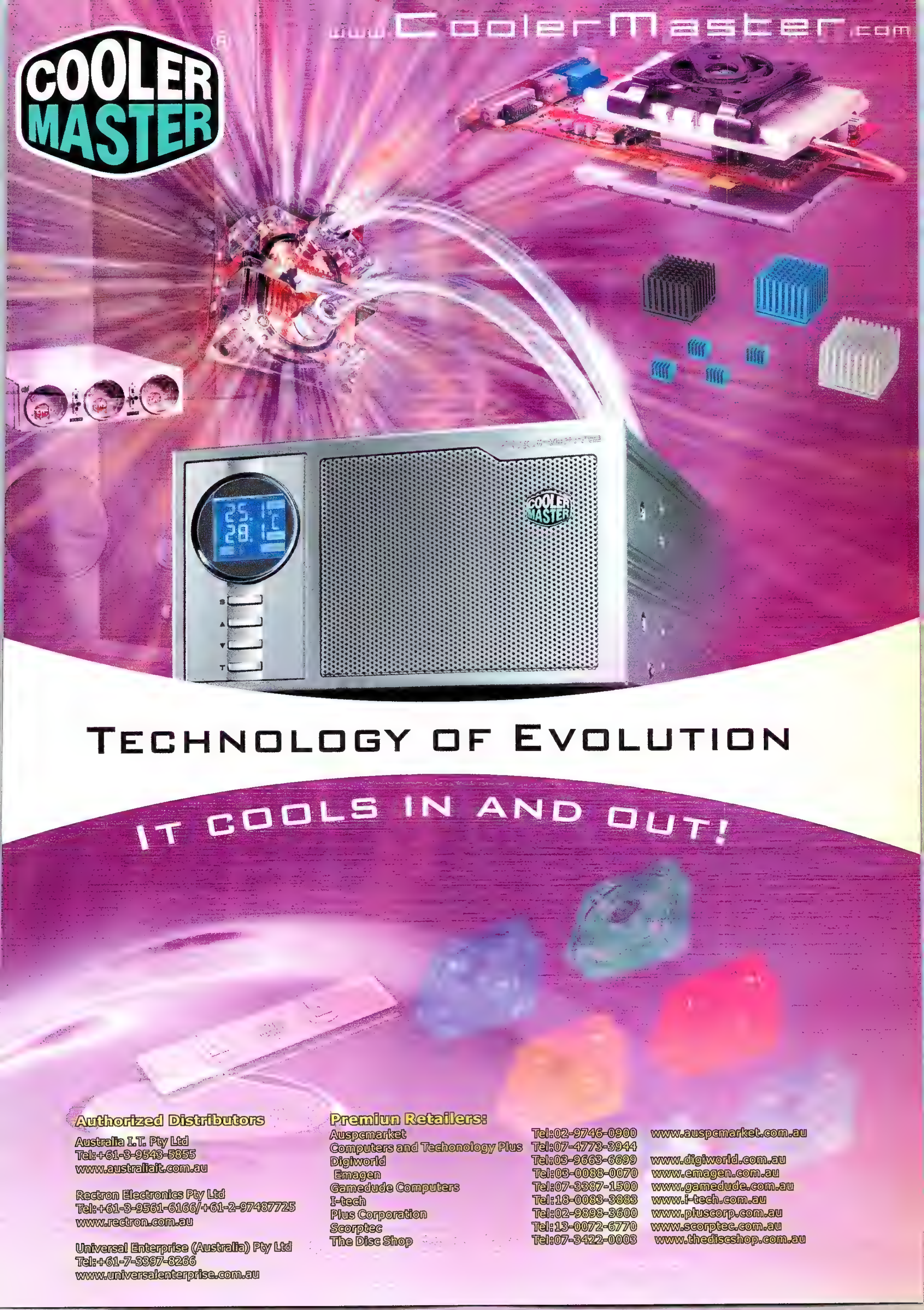

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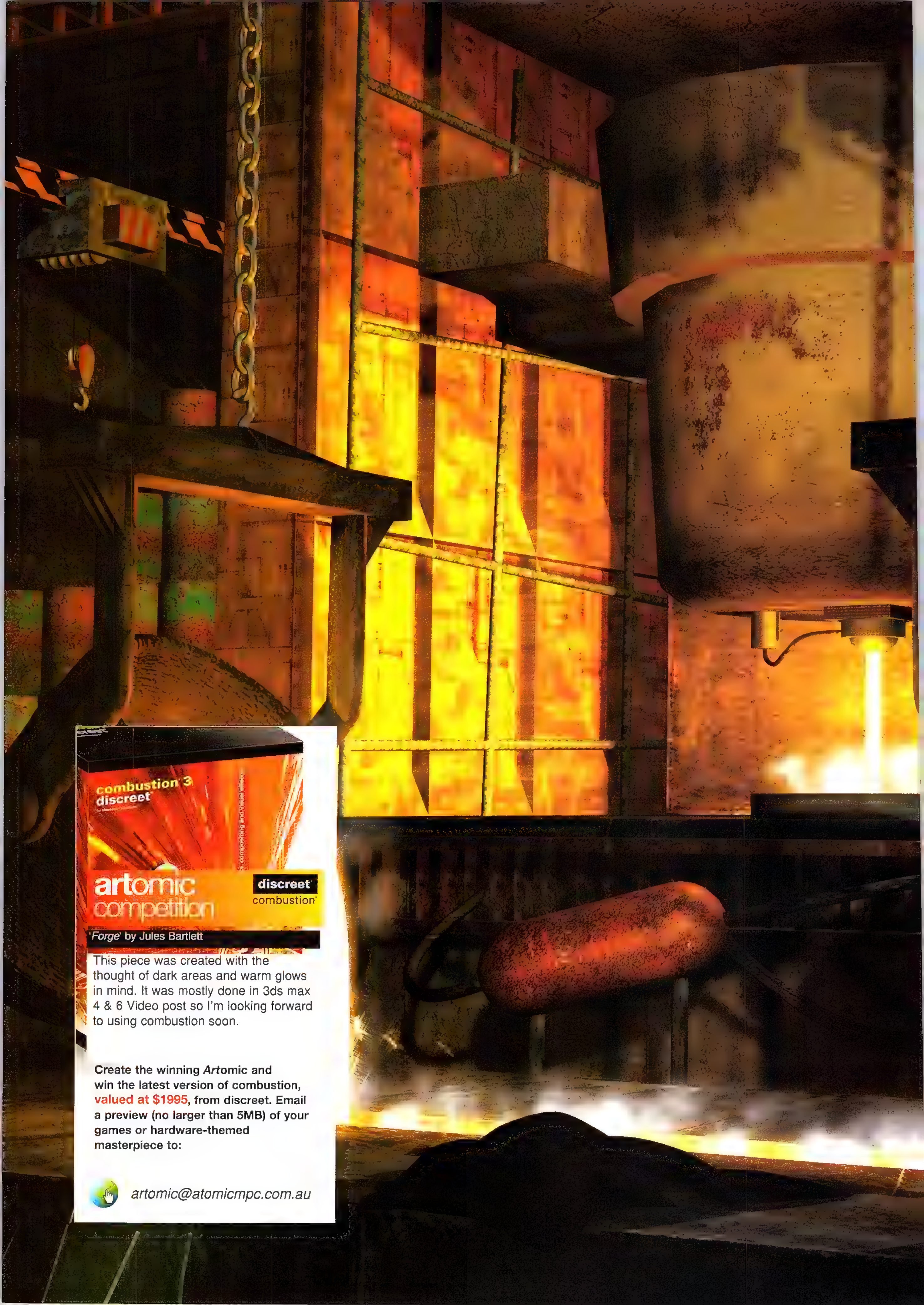

artomic competition

'*Forge*' by Jules Bartlett

This piece was created with the thought of dark areas and warm glows in mind. It was mostly done in 3ds max 4 & 6 Video post so I'm looking forward to using combustion soon.

Create the winning *Art*omic and win the latest version of combustion, valued at $1995, from discreet. Email a preview (no larger than 5MB) of your games or hardware-themed masterpiece to:

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Reviews

Nanobots can do anything. Any-thing

Excitedly, Nathan Davis goes all out kinky on us with nanobots.

There I was, merrily having a great shower, washing – among other things attached to my largest organ – my hair, and a thought struck me just prior to a wonderfully painful gob of soapy shampoo landing in my right eye.

The thought – apart from being intentionally evil, and occurring in kinda my favourite weird place to think of these things – was how cool nanotech robots, or nanobots, truly are. Nanotechnology is damn neat and nanobots are where it's at. Aside from being just another excuse to shrink the video camera and microphone, these fellas would be *very* useful to have around the place, inside and out of your body, and just generally everywhere.

Their uses are practically endless. Nanoscopic servants that will literally do anything they are programmed to. It's like slavery of the future, only legal. Nothing could possibly beat that.

Take nano-cleaning for example. Nanobots could clean and dry the dishes so efficiently that the word 'clean' just wouldn't suffice. In fact, imagine cooking with heat-resistant nanobots – a good army of cooking nanobots could keep the food from sticking to the cookware, or, instead of using the usual pots and pans that tend to be on the receiving end of dirtiness, they could *become* the cookware. I'm pretty sure interactive cookware would start a craze bigger than Tupperware. Imagine seeing a motionless pancake seemingly flip itself onto a plate with 'Good Morning ;)' written on it. That, my friend, is putting technology to the best possible use.

Then there's our own bodies. Nanobots could help by getting to the areas we find difficult to access – or just general body 'house' keeping – protecting and cleaning teeth, inside the ears, up the nose and other random orifices. They would access the areas our clumsy cleaning tools couldn't, and in a less painful manner. It sure beats using three beach shells, Demolition Man-style, to clean up after a doo-doo.

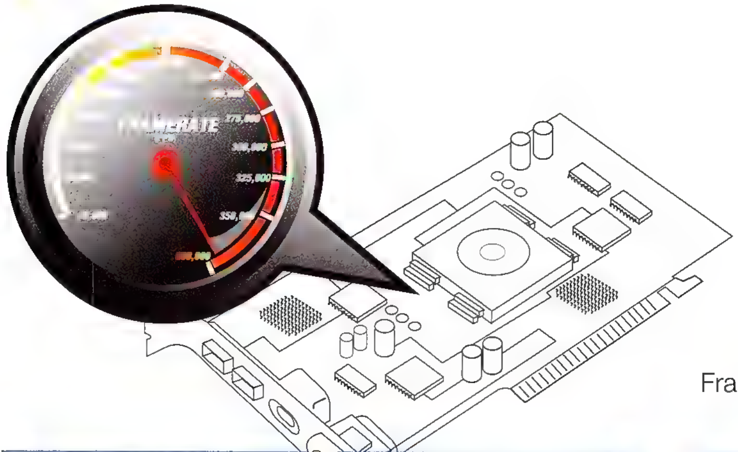
But medical advantages will probably be the largest benefactor from nanotech's nanobots. Let's say you get a cut – nanobots that may already inhabit your body could be programmed to mend the broken area, and quite possibly, seeing as they are operating at the nano-level, completely heal it as if the wound was never there. Inside the body could finally be cleansed of, for example, the results of tobacco smoke in your lungs or fat build-up in your arteries. Nanobots could be used to completely flush out all that. Then there's the disease fighting abilities – endless possibilities – and nanobots could quite possibly be used to reach the dream many-a-human have aspired to grasp; extending life.

Privacy could be a problem, but this is why you have your own army of nanobots to find and destroy those voyeurism bots. And that brings us to another issue that could come up in future: nanobots will bring forth a revolution in how wars are fought. As they would be programmed to attack the other side – nanobots or otherwise – we likely wouldn't have any degree of control over these nano-level wars, we'd simply be in the crossfire of, essentially, an instantaneous war. It'd almost be over before it started, as nanobots would, at least theoretically, be capable of calculating and reacting to situations within the space of a split millisecond. We wouldn't be any wiser apart from being alive, dead or even having our bodies taken over. Regardless, it's utterly sweet.

Anyway, I've thought up something else far greater that stomps on any worries. Think of this folks: nanolube – the future of Viagra. An intelligent lube that can learn and knows what buttons to push when and where. That's *hot*.

There's nanotechnology, but then there's nanobots. Whether used for medical, warfare, entertainment, exploring purposes or a mix of them all (ahem), nanobots are fully exciting and coming for us on a grand tiny scale. Someday.

Nanonature calls, toodles.



Framerate

Grab your spoon and prepare to be awed as Framerate is tipped on its head by a new generation can o' tasty whoop arse.

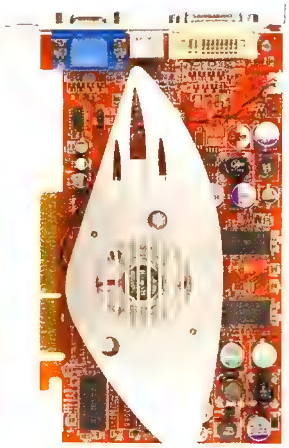
PowerColor X800 PRO Assassin Edition

Specifications: ATI RADEON X800 PRO; 256MB 256-bit GDDR3 RAM; 400MHz dual RAMDACs.
Core speed: 475MHz
Memory speed: 900MHz
Price: $770
Supplier: Australia IT
www.australiait.com.au

As the X800 PRO comes smashing into the gaming scene it's accompanied by some very interesting bundles. PowerColor has taken the opportunity to ship a limited number of cards with a free backpack, and all its X800 PRO cards with Hitman: Contracts. But what we love the most is that while Half-Life 2 vouchers do not come with any of the X800 cards, Australia IT has decided to run a limited bundle of this soon to be released game with the first X800 PRO cards it ships. Special.

PowerColor
www.powercolor.com.tw

ABIT RADEON R9600XT-V10

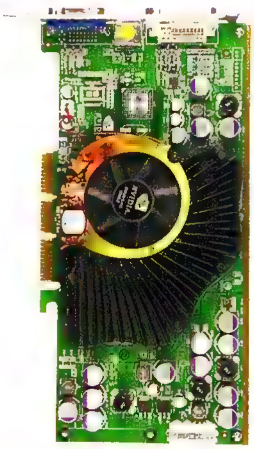


Specifications: ATI RADEON 9600XT; 256MB 128-bit DDR RAM; 400MHz dual RAMDACS.
Core speed: 500MHz
Memory speed: 600MHz
Price: $340
Supplier: Altech
www.altech.com.au

We're yet to figure out why in tarnation an ugly slab of metal was slapped on top of the heatsink, but overall this is a great budget card. It's fully capable of keeping some decent frames in gameplay as with most other beautiful 9600XT cards. Forget about overclocking this one to any great degree though, as it's coupled with eight Samsung 3.3ns TSOP memory modules. A well performing, fairly quiet 9600XT equipped with VIVO which would definitely serve well as a budget gaming card.

ABIT
www.abit.com.tw

Sparkle SP8836U3-DT GeForce FX 5700 Ultra



Specifications: NVIDIA GeForce FX 5700; 128MB 128-bit GDDR3 RAM; 400MHz dual RAMDACs.
Core speed: 475MHz
Memory speed: 950MHz
Price: $330
Supplier: Australia IT
www.australiait.com.au

Shimmering in all its digital light-creating goodness, this FX5700 Ultra card is marching into the new norm, showing a great level of mediocrity with its four GDDR3 BGA memory modules. Even though it does use GDDR3, overclocking isn't its best feat, barely managing to scale up to 1.08GHz. Like all other FX5700s, it's still built on a 0.13-micron process and apart from its different memory, the only unique thing about it would be the glistening metal strip on the side. Performing on par with a RADEON 9600XT, it's definitely not dull.

Sparkle
www.sparkle.com.tw

Gigabyte GeForce FX 5500 2004 GT Edition

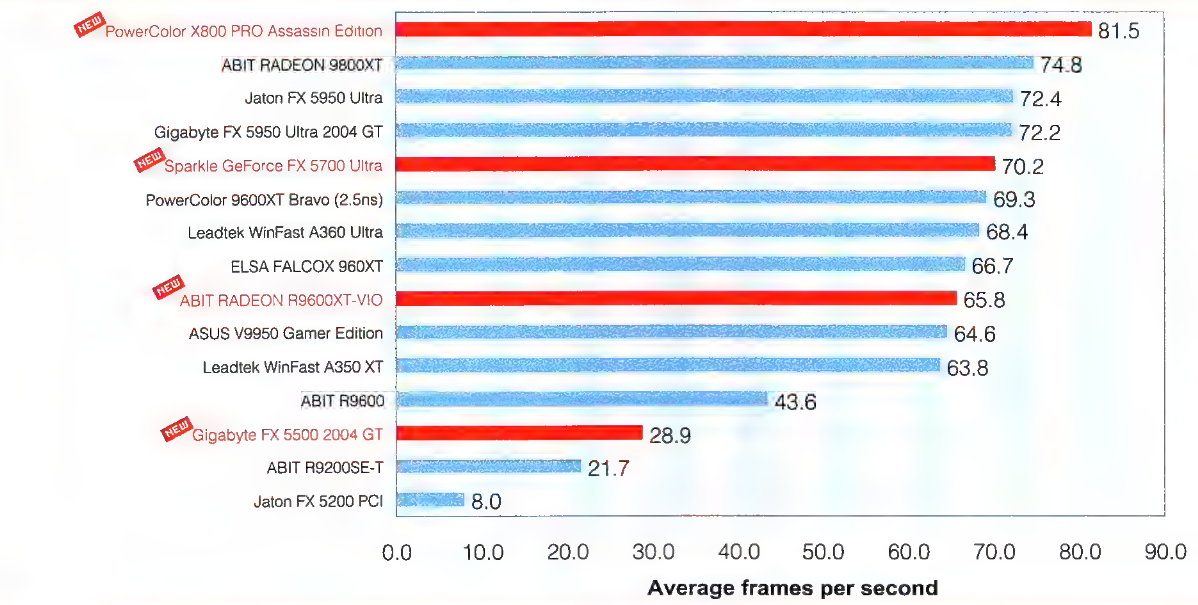
Specifications: NVIDIA GeForce FX 5500; 128MB 128-bit DDR RAM; 400MHz dual RAMDACs.
Core speed: 300MHz
Memory speed: 500MHz
Price: $169
Supplier: Synnex
www.synnex.com.au

Gigabyte has whacked a fantastically small heatsink on this card and, surprisingly, unlike ABIT's trademark 'largest organ burner' design, it keeps a cool core. The problem here is that a faster fan is required, so although it's not blatantly loud, it is louder than you'd wish for a Home Theatre system, which is what this card would be great for. Now, there are faster and quieter alternatives out there, however they aren't quite as easy on the wallet. This would be an ideal card for an HTPC, just pop on some quieter cooling.

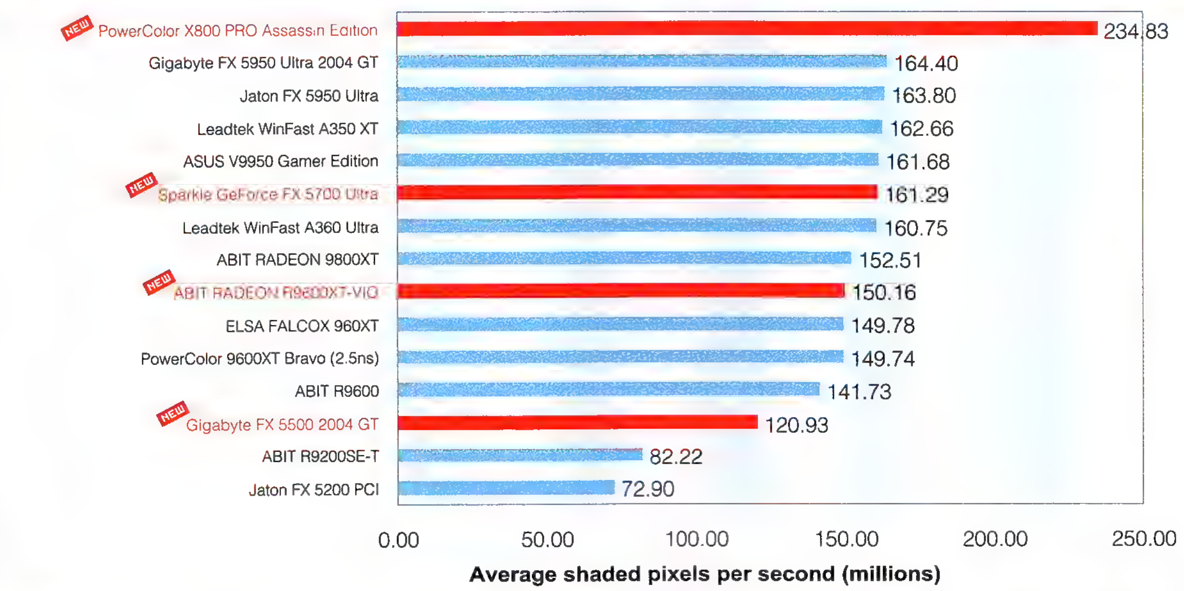
Gigabyte
www.gigabyte.com.tw

Powdered glass is nowhere near as deadly as it's made out to be. A piece of glass large enough to kill you would be quite noticeable, even in powder form.

Call of Duty



Aquamark 3



Video cards

Now that the RADEON X800 PRO and GeForce 6800 Ultra are sliding their way into retail we are looking forward to a month of numerous new cards appearing. The reason for this is twofold. Firstly we have ATI's 16 pipeline X800 XT, which we preview in this issue, and NVIDIA's slower-than-an-Ultra 16 pipe GeForce 6800 GT and 12 pipe GeForce 6800 cards, and secondly we have the launch of PCI-Express based cards to accompany Intel's new chipsets. The first PCI-Express cards to appear seem likely to be based upon the previous generation of cards, our manufacturing contacts expect that the first PCI-Express products will be the GeForce PCX 5750, which is based on the GeForce FX 5700. After this we should see the high end cards flowing into the market, with no significant architectural differences but slight clock speed boosts over the AGP based RADEON X800 and GeForce 6800 cards. It also looks like PowerVR might finally be getting back into the game, as Imagination Technologies' recent financial statement mentioned that the PVR series 5 architecture is ready for the PC.

CPUs

While Intel's netburst architecture may be dying in the Tejas (pronounced Tey-has, it's Mexican), we are hoping that the launch of Socket T alongside Intel's i915 and i925 chipsets will bring much needed respectability to the Prescott core. We will have the full lowdown on how this new generation of CPUs work in the next issue of *Atomic*. In the mobile space Intel recently unveiled its 90nm strained silicon based Dothan core for the new generation of Pentium-M CPUs. This ups the L2 cache from 1MB to 2MB and brings enhanced prefetch to the architecture. Unlike its 90nm desktop cousin – Prescott – Dothan does not support the new SSE3 extensions, instead supporting SSE1 and SSE2. AMD has also just launched it's new Socket 939 Athlon 64 and Athlon 64 FX CPUs, finally dragging the Athlon 64 up in speed from the now long serving Athlon 64 3400+ model. The high end of the lineup now sits at 3800+, with a mixture of 1MB and 512KB L2 cache sizes throughout the range.

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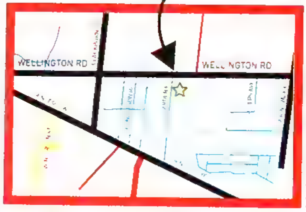

Mel ref. pg70, J12

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ASUS AX800 PRO

John Gillooly watches as ATI's 12 pipes gush gaming goodness.

Supplier:
Achieva Technology
www.achieva.com.au

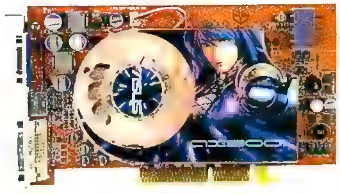
Website:
ASUS Australia
www.asus.com.au

Phone:
Achieva Technology
(02) 9742 3288

Price:
$720

Specifications:

ATI RADEON X800 PRO; 12-pixel pipeline; 256MB GDDR3; 475MHz core; 900MHz RAM; requires single Molex connector; AGP 8x.



Of all the hardware releases it is the new generation of video cards that make even the most hardened PC freak start giggling and dancing around like a little kid. It also marks the point at which fast no longer means as fast as it once was. Now that retail cards based on ATI's X800 and NVIDIA's GeForce 6800 have started to appear, the reign of the 9800XT is over and all bets are off.

ATI has two basic types of X800 card and, unlike previous generations, the difference goes beyond clockspeeds. At the top of the high end sits the still rare X800 XT, which has full 16-pixel shading pipelines, while the more mainstream but also high-end X800 PRO has 12 shaders.

The first X800 PRO into the *Atomic* labs comes from recent-comer to the ATI party, ASUS. Apart from the colour of the PCB it did not differ in any significant way from ATI's reference design, which is something we have become used to over the past few years.

We tested the X800 PRO against the same cards we used in our GeForce 6800 versus RADEON X800 head to head feature last month. We used a 3.4GHz Pentium 4 Extreme Edition to minimise chances of our benchmarks becoming CPU bound, and our testing was done with the WHQL release CATALYST 4.5 drivers. It's important to note that the GeForce 6800 Ultra card is an NVIDIA engineering sample and may not be exactly indicative of final retail performance.

Without again weighing into the validity of 3DMark03, the X800 PRO sat neatly between the previous high mark of the 9800XT and the GeForce 6800 Ultra's impressive score. However, this picture didn't flow through into the rest of the tests. In Aquamark 3, for example, the X800 PRO was 38 percent faster in the pixel shading tests and performed at the same level as the GeForce 6800 Ultra in the others.

A similar picture emerged in UT2003. Under standard conditions the 6800 Ultra held a tiny lead over the X800 PRO, but they were neck and neck when 4x antialiasing and 4x anisotropic filtering was used. In Far Cry it was the X800 PRO that held a tiny lead over the 6800 Ultra, and that game in particular looked absolutely gorgeous on both cards.

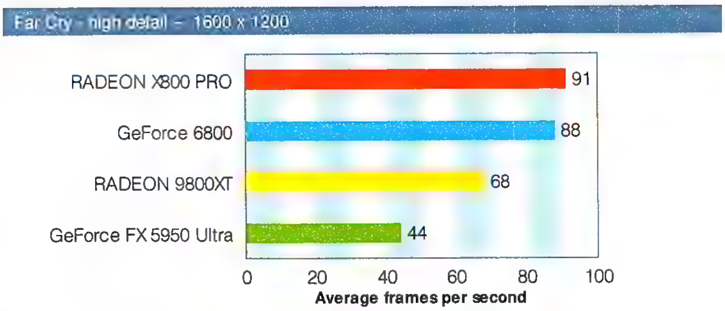
From these tests it was clear that the X800 PRO is eminently capable of raw performance parity with a card that should be outside its league.

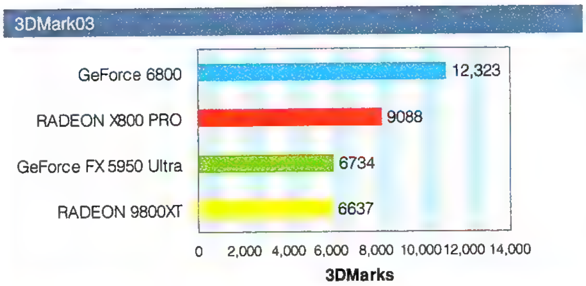
It does not support Shader Model 3, as NVIDIA's offering does, however we are still not sold on the importance of having SM 3.0 support in the current generation of cards. For the foreseeable future at least, the AX800 PRO will deliver a superb gaming experience, especially considering its support of 3Dc normal map compression as well as its 12 pipelines of pixel shading goodness.

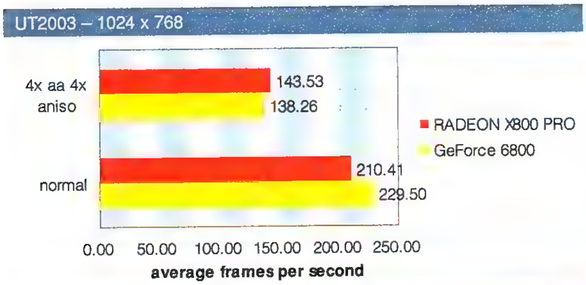
One interesting thing to note with the ASUS AX800 PRO is that unlike the 9800XT, there is no mention of Half-Life 2 and no voucher promising the game when Valve actually gets around to releasing it. Instead, ASUS has bundled the somewhat crappy Quake 2 engine-based Counter-Strike: Condition Zero and the graphically impressive Deus Ex: Invisible War.

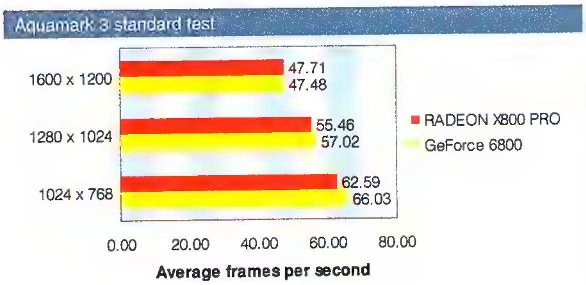
While it may not conjure up the same feeling of wonderfully obscene performance that its X800 XT big brother does, the AX800 PRO is an exceptional piece of 3D hardware. It can perform at a level similar to NVIDIA's best and do so at a cheaper price and with a lower performance hit. This chip is shaping up as the next must-have piece of kit. JG

SCORE 9.5/10









Canola oil is not toxic; however, you should use olive oil whenever you can. It just tastes better.

Cooler Master CM Stacker

Supplier:
Australia IT
www.australiait.com.au

Website:
Cooler Master
www.coolermaster.com

Phone:
Australia IT
(03) 9543 5855

Price:
$253

Specifications:

Brushed aluminium shell; Steel frame; 12 x 5.25in drive bays; three 3.25in drive bays; Supports ATX, E-ATX and BTX motherboards; room for two PSUs; six USB, one IEEE1394 and two audio ports on front.

Just when we thought that case design had stagnated, Cooler Master goes and releases the CM Stacker, a case targeted at the modern age of flashing lights and front-panel controls.

On paper it is the perfect framework for power users and modders – it has a total of 12 5.25in drive bays running down the entire front of the case, room for two power supplies, and a motherboard tray designed to cope with ATX, Extended ATX and even the new BTX form factors.

Flexibility and expandability are the keys to the CM Stacker. The power and reset buttons sit on a moveable 5.25in panel, alongside one audio, one FireWire and an impressive six USB ports. The 3.25in drive bays come in a moveable three-drive block that occupies three 5.25in bays, with a quiet 120mm fan for cooling and rubber grommets to dampen drive noise.

Constructed around a solid, and heavy steel framework, the CM Stacker is covered with a stylish brushed aluminium shell. The front-panel covers are made of a steel mesh backed with filter material, which allows for good airflow through the entire front of the case. The side panel also features a large circular panel, made of the same mesh/filter combo, on one side. The other side panel has a punched out grill, designed to work as the intake for Cooler Master's optional crossflow fan, which blows a wave of air across the motherboard.

This motherboard sits on a removable tray, which is always a handy addition to a case, although to remove the tray involves the loosening of an inconveniently large number of screws.

To finish off the cooling capabilities there is an 80mm fan venting out the top, a 120mm rear exhaust, and a panel on the optional second power supply bay that can take dual 80mm fans.

The Stacker offers an unprecedented level of expandability, superb attention to detail and a build quality among the finest we have seen. Congratulations must go to Cooler Master for an innovative product, tailored to the needs of the modern power user. JG

hotaward

SCORE **9.5/10**

Lian Li PC-V1000

Supplier:
Anyware
www.anyware.com.au

Website:
Lian Li
www.lian-li.com.tw

Phone:
Anyware
(07) 3856 3999

Price:
$390

Specifications:

Completely constructed from brushed aluminium; six 3.25in and five 5.25in drive bays; two 120mm fans; tool-less design; two USB, one IEEE1394 and two audio ports on the front.

Lian Li invented the brushed aluminium look that has become the *de facto* standard for good looking cases, pairing style with cooling-savvy case design and bringing us the sheer joy of the tool-less case. It has been a long time between designs for Lian Li, but with the PC-V1000 it is showing the system building public that it has not dropped the ball along the way.

If we are to dip into cliché for a moment, the PC-V1000 offers some serious flattery to Apple's G5 design, while still retaining an identity of its own.

The entire case is made from nice thick aluminium, with the front and some of the rear perforated with small holes to enable good airflow.

On removing the side panel, the first thing that strikes you is that those wacky engineers at Lian Li have turned the PC world on its head. The power supply mounts at the bottom of the case and the motherboard screws in upside down, violating one of the most sacred paradigms of the computing world. But on second look, it actually makes a lot of sense and the layout forms part of a carefully considered airflow design.

For ease of use, the 3.25in drives mount into their bays horizontally, using quick release rails. This compartment contains six bays and is segmented from the PSU and motherboard areas. It is cooled by a quiet 120mm fan. Next to the motherboard tray is room for five 5.25in drives.

To cap it all off, not only does the case come with wheels, the wheels have a brake on them to stop your PC accidentally rolling through the door and down the street. It's cute, and quite functional – and we cannot wait to see the first motorised wheel mod to appear.

Our only concern with the PC-V1000 is that the perforated design will ensure that it fills with dust quicker than any other case we have reviewed so far. But that is a small issue when lined up against the multitude of great features that make this one of the standout cases on the market today, with a price tag to match. JG

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SCORE **9/10**

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CPL	03-85428688	cpl.net.au

MSI NX6800 Ultra

It's the next generation NVIDIA card, and John Gillooly doesn't mind it at all.

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MSI
www.msicomputer.com.au

Website:
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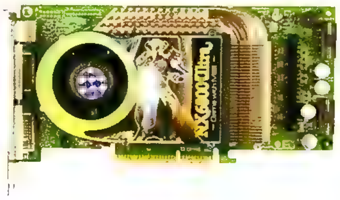
www.msicomputer.com.au

Phone:
MSI
(02) 9748 0070

Price:
TBA

Specifications:

NVIDIA GeForce 6800 Ultra; 256MB GDDR3; 16 pixel pipelines; Shader Model 3.0 support; requires two Molex connectors and at least a 350 watt PSU.



Now that the twitching corpse of the FX series is being brushed to the side, NVIDIA is regaining respectability with its GeForce 6800 Ultra. While we have seen the reference card already, MSI has been first to supply us with a retail variant of NVIDIA's high end offering, the GeForce 6800 Ultra, in the form of its NX6800 Ultra.

The only physical difference between these production cards and the engineering sample is the heatsink, which is a big two slot sucker, without the external venting of the GeForce FX 5800, and distinctly less noise than the previous generation of coolers. It is still noticeably louder than ATI's competing products though.

The good news is that the heatsink copes well with the sheer amount of heat generated by the 222 million transistor, 120 watt GeForce 6800 Ultra chip that lies at the heart of the NX6800 Ultra.

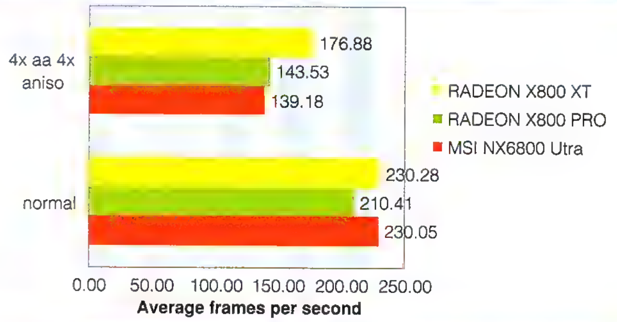
To power this all, the NX6800 Ultra requires two Molex connectors, and the box recommends a 350W PSU (although we wouldn't want to see you try and run this and a Prescott using such a supply). There has been considerable confusion about exactly what connectors need to be used, and whether they should run on separate rails, but we recommend that you just plug both in to avoid weirdness.

We tested the card using a 3.4GHz Extreme Edition Pentium 4 to minimise CPU-bound conditions, although they are still a very common occurrence. The testing was with the NVIDIA ForceWare 60.83 drivers that shipped with the card, but we did disable NVIDIA's Trilinear filtering 'optimisations' in the driver control panel.

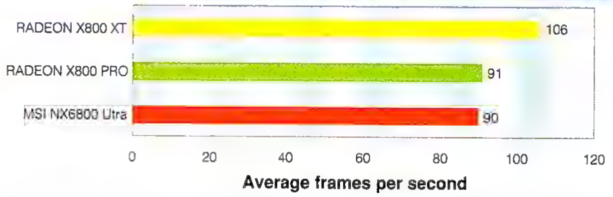
In a fit of nostalgia we threw 3DMark2001SE Pro into the benchmarking mix, which showed a similar result to Aquamark 3, with the NX6800 Ultra sitting almost level with the X800 PRO, behind the X800 XT. In Far Cry and UT2003 we can see the pattern continue, although this cannot be easily inferred as a future trend, as once games start taxing pipelines more, the 16 pipes of the GeForce 6800 Ultra could help pull it ahead of the 12-piped X800 PRO.

While the benchmarks showed the card performed at the same level as the X800 PRO, you need to remember that all the new generation perform exceptionally well in pretty much every game on the market. We simply do not have the sort of software with which to predict the future of these cards. ATI's X800 may have very similar pipelines to the 9800XT, but it has lots of 'em, and support for the very useable 3Dc texture compression technology. The GeForce 6800 on the other hand has 16 all-new pipelines, that not only deliver screamingly fast shading in current titles, they also support the next generation Shader Model 3.0. We cannot give an answer on when we should expect to see games supporting SM 3.0, but for futureproofing it is handy to have. With the FX 6800 Ultra, NVIDIA is back, and even though it is now in bed with ATI as well, long term partner MSI must be breathing a sigh of relief. JG

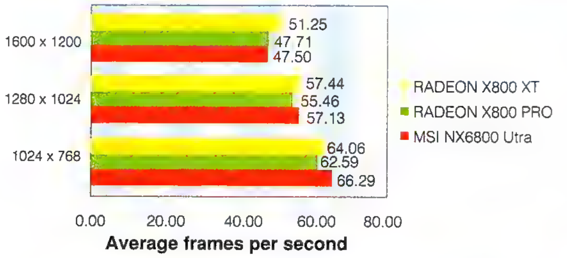
UT2003 - 1024 x 768



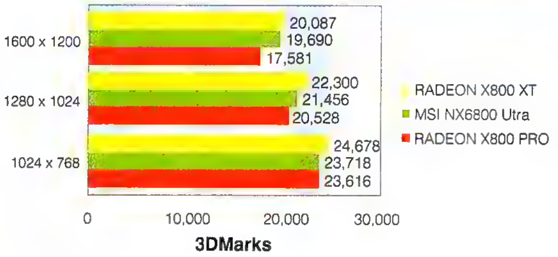
Far Cry - High detail



Aquamark 3 – Standard test



3DMark2001SE Pro – Standard test



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SCORE 9/10

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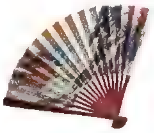

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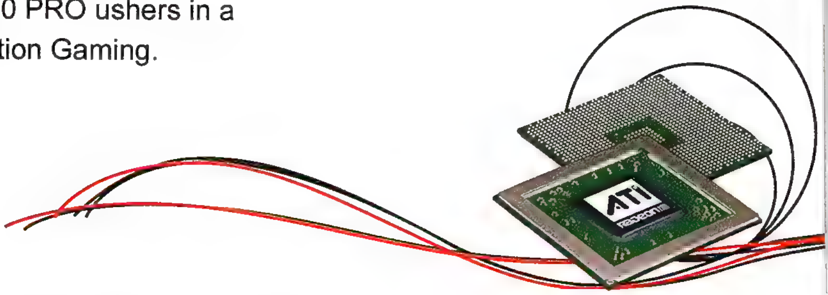

ATI™

ati.com

PowerColor RADEON 9550

Nathan Davis counts back from 9600 and caresses this new core with a pencil.

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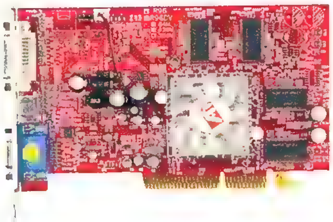
Supplier:
Australia IT
www.australiait.com.au

Website:
PowerColor
www.powercolor.com.tw

Phone:
Australia IT
(03) 9543 5855

Price:
$180

Specifications:
ATI RADEON 9550; 250MHz core clock on a .13-micron process; 256MB 400MHz effective 5ns TSOP DDR on a 128-bit bus.



Budget cards have dramatically increased in popularity in recent times. We can't entirely put this down to the fast growing Home Theatre PC (HTPC) market because there isn't such a thing at the moment. HTPCs are still very much a niche thing and yet to take full flight.

As these cards are getting more powerful and capable of actually playing games – as compared to the now-old feeling of 'that's a great slideshow' – their popularity has jumped.

Unfortunately for ATI, the RADEON 9200 wasn't nearly as richly featured – and as we discovered, no where near as powerful – as it would have liked, and as a result, NVIDIA's entry-level cards such as the FX 5200 were fast doing the rounds in the budget card market.

The FX 5200, in fact, consistently stole the podium when it came up against the 9200. ATI didn't particularly like this.

This is where we cut the curtains lose and welcome ATI's new budget baby – the RADEON 9550 – to the cost-effective dancefloor. This card isn't based around the 9500 core, but rather a slightly cut down version of the 9600. It has a slower core – down from 325MHz to 250MHz – and is minus the Low-K dielectrics. Yep, this means it's a DirectX 9.0 card. It still has two vertex pipelines, four pixel pipelines and a 128-bit memory bus (however there will be a 64-bit version, the RADEON 9550 SE).

The DirectX 8.1 compliant RADEON 9200 received a bad rap as it simply wasn't good for games at all, but it was definitely useful for HTPCs. Which would probably explain the lack of attractiveness to gamers.

Checking over the test results, we were rather impressed with the 9550's performance, particularly for the price. It was very much on par with the 5700LE in most tests, and proved its superior level of pixel shading with minor frame loss in CoD – until we bumped the clocks up to a stable 332MHz core and an effective memory clock of 460MHz, which is damn good for 5ns TSOP modules. It's not too much of a clock change, but it showed it can perform loads faster with such an overclock – 10 frames is nothing to snub off.

Luckily cooling isn't a worry – even when overclocked and under full load the card remained chilly. The fan isn't totally silent, but quiet enough to ignore – the FX 5700LE test card, on the other hand, was a lot louder.

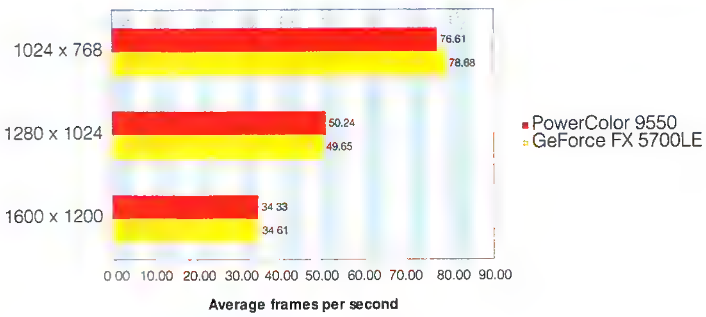
As we've been saying for some time, there's no good reason for 256MB of memory on a card such as this. If you have a game that requires 256MB worth of textures, you wouldn't be wanting to use a 9550.

Nothing to eat your socks away with, but better budget cards have been increasing in output and this one has proved its worthiness. It's even cheap enough to throw in a computer-illiterate's machine or in a HTPC. But can it be a gaming card? As low as the scores seem to be as compared to, say, a 9800XT, these are still quite playable. They're nothing to go bragging about but will certainly allow you to game while on a tight budget.

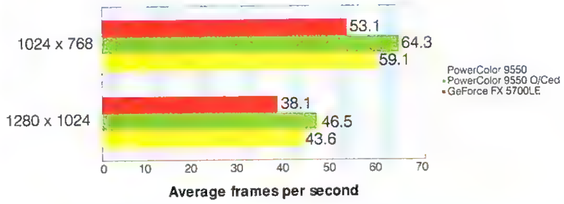
ATI now has itself a worthy contender in the budget conscious arena and PowerColor has pulled this one off nicely. It's certainly not a powerhouse, but if you're on a shoestring and you're after a card that does more than simply allow you to analyse individual frames, the 9550 shapes up nicely. ND

SCORE 9/10

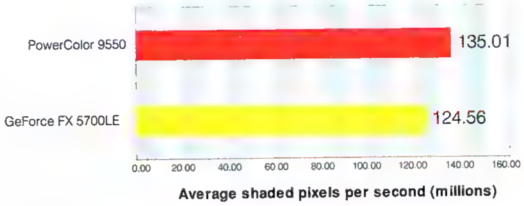
Unreal Tournament 2003



Call of Duty



Aquamark 3



Leonard Nimoy performed the voice for Galvatron in the original *Transformers* movie back in 1986.

RADEON X800PRO/XT PLATINUM

- Powered by AGP 8X ATI RADEON X800 PRO Visual Processing Unit (VPU).
- Increased 256-bit with GDDR 3 memory interface delivers the bandwidth for real time 3D gaming, graphics and barrier free performance.
- Support for Microsoft® DirectX® 9.0 programmable vertex and pixel shaders.
- Integrated 12 parallel rendering pipelines for incredibly fast 3D graphics.

RADEON 9550/XT PLATINUM

- Powered by AGP 8X ATI RADEON 9550 Visual Processing Unit (VPU).
- Supports 128MB DDR memory for today demanding games, applications, effects and animation.
- Enjoy better performance and 3D imagery in multimedia, games and applications with Microsoft DirectX® 9 optimized architecture.
- SMARTSHADER™ 2.0 technology supports Microsoft® DirectX® 9 feature sets, enabling more complex and cinematic-quality lighting effects.

GC-AIW96XT

- Powered by the AGP 8X, RADEON 9600XT Visual Processing Unit (VPU).
- TV-ON-DEMAND records programs on your hard drive, pauses live TV and resumes broadcasts on your schedule.
- New! Use FM-ON-DEMAND to record radio programs and play them back just a click.
- THRUVIEW creates live, translucent TV, video and DVD windows for easy desktop access.

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Gigabyte GA-K8NSNXP

Supplier:
Synnex
www.synnex.com.au

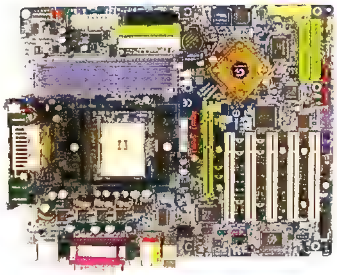
Website:
Gigabyte
www.gigabyte.com.tw

Phone:
Synnex
1300 880 038

Price:
$329

Specifications:

Socket 754 Athlon 64 support; NVIDIA nForce3 250 chipset; one GbE port and one 10/100 Ethernet port; 5.1 AC97 audio; four SATA channels; Parallel ATA RAID.



We have been eagerly awaiting NVIDIA's nForce3 250 chipset for some time now. The original nForce3 150 chipset was launched in the days of Opteron and, while it was a competent performer, it lacked some key features, such as integrated Serial ATA channels, which we see as essential for maintaining a smooth upgrade path.

It's a shame that the first board we have seen sporting this chipset comes just as AMD finally pulls the covers off its new socket 939 form factor for the Athlon 64.

Gigabyte's K8NSNXP is a well-featured implementation of NVIDIA's single-chip solution, however it uses the now legacy socket 754.

Because the memory controller for the Athlon 64 is built into the CPU rather than the chipset, the advantage of the nForce3 250 chipset lies not in a performance boost, but rather in the introduction of new features like native support for two Serial ATA (SATA) channels. Gigabyte has also included a Marvell Gigabit Ethernet chip rather than use NVIDIA's native Gigabit chipset, the nForce3 250 GbE.

This is important to note, because there are some distinct feature differences between the nForce3 250 seen on this board and the nForce3 250 GbE. Most notable is that the GbE version adds hardware firewall support as well as 'high-performance networking features'.

While the inclusion of native SATA is a godsend, it really is the only improvement to the original nForce3 chipset. With the PCI Express revolution starting to get a roll on, and the changing of the Athlon 64 socket well underway, it is hard to see a board like the GA-K8NSNXP providing much in the way of future upgrade paths.

That said, the GA-K8NSNXP is a very nice board, with dual Ethernet, four USB ports onboard, Parallel ATA and SATA RAID, and Gigabyte's Dual power tech – all combining to deliver a robust solution for socket 754 Athlon 64 CPUs.

It is one of the best socket 754 boards we have tested, which is a shame considering that it has come so late in the day, as Socket 939 boards are starting to fizzle out. JG

SCORE 8/10

SoniqCast Aireo

hotaward

Supplier:
SoniqCast

Website:
SoniqCast
www.soniqcast.com

Phone:
N/A

Price:
US$299

Specifications:

Portable digital audio player with 1.5GB HDD; 802.11b Wi-Fi support; USB; built-in FM transmitter and receiver; SD/MMC expansion slot; two 3.5mm headphone jacks; built-in Lithium-Ion rechargeable battery with low power warning; MP3, WMA and VBR support.

With its trippy blue backlight, and simplistic design, it's easy to pass this off as 'another iPod wannabe'. But for starters it's much larger, and this player had us excited due to two main features – it can use Wi-Fi for data transfer and can act as a close-proximity FM transmission base. It also has a sizeable 1.5GB HDD, and as it turns out, is totally silent with no vibrations. And even though there's a hard drive in there with barely any form of ventilation, the level of heat hardly jumps over lukewarm.

When connected via USB (not USB 2.0, unfortunately), you will have access to a 1.5GB drive to copy what you please onto, or if you just want to play some music and you have Wi-Fi 802.11b on your machine, it's a great addition. But you must use playlists.

All audio, if it's to be played on the Aireo, is transferred and sorted via playlists, so forget about copying individual music directly to the player. Whether you like playlists or not, it basically means that if you want to, say, play a single specific audio file, you need to remember which playlist it's in. Unless you make one large playlist. We would still like to see an update that allows you to browse through all files regardless of category.

Unlike the iPod, FM transmission comes packed with this baby, though we are unsure if it fully passes Australian radio laws (it complies with Canadian standards), as you can select any FM frequency and spurt out your favourite music over, say, an already existent radio channel you dislike. It works surprisingly well, but you must be within good range of reception for it to work with decent clarity, which is why it's perfect for the car.

The headphones it came with weren't *too* shabby, but when replaced with a better set, this player can spit out some decent audio at 20Hz – 20,000Hz. Outfitted with two headphone jacks, it's all ready for some hot dual action. It's just a pity there's no microphone or radio recording ability.

Not yet in Australia, it'll be interesting to see what the starting retail price will be, considering how inexpensive the larger capacity iPods are. With a 1.5GB HDD, there's plenty of room for the average audio listener. Overall, packed with features such as Wi-Fi, FM reception and transmission and an SD/MMC expansion slot, this is a praiseworthy portable audio player. ND

SCORE 9/10

No amount of tapping or rubbing of a shaken-up Coke can will prevent it from gushing out when opened.

PREVIEW ATI RADEON X800 XT

John Gillooly previews an engineering sample of ATI's latest high end monster.

Supplier:
N/A

Website:
ATI
www.ati.com

Phone:
N/A

Price:
TBA

Specifications:

RADEON X800 XT; 16 pixel shader pipelines; 256MB GDDR3 memory; requires one Molex connector.

As the X800 PRO takes its first steps into retail, ATI and its partners are readying the RADEON X800 XT behemoth for launch. While we will have a retail X800 XT card for review in the next issue of *Atomic*, we have been playing around with an ATI X800 XT engineering sample to see just how fast the R420 core runs with all 16 pipelines on the go.

There are two key differences between the X800 PRO and the X800 XT. The first is the traditional gap in clockspeeds that ATI has historically used to break up its high end products. The core of the PRO runs at 475MHz, with memory at an effective 900MHz, while the XT core clocks in at 520MHz and the memory at a brain melting 1.2GHz effective speed. But the big difference is that the PRO version sports 12 pixel shading pipelines while the XT has a nasty 16 of the suckers for your visual pleasure (NVIDIA is doing a similar thing with the product segmentation in the GeForce 6800 range). Unlike previous attempts of this kind which have relied on software based locking (and hence the possibility of software based unlocking), this time ATI has locked the number of pipelines in hardware, much like CPU makers lock clocks. However there are already reports appearing about the possibility of unlocking the pipes through a method similar to that used when unlocking Athlons – by joining bridges on the chips.

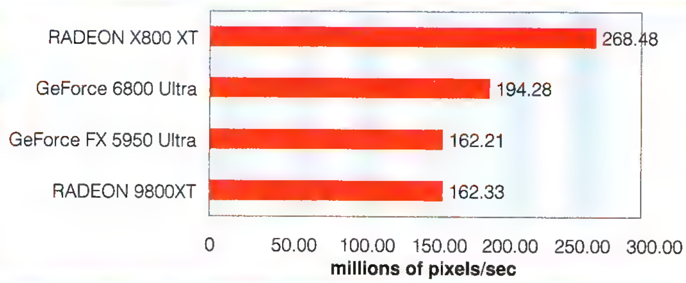
We ran the RADEON X800 XT card through the same tests as our RADEON X800 PRO review this issue (*page 49*) , to get an idea of how much faster the X800 XT really is. Our first test was a curiosity value run with 3DMark03, one of the only tests in which the GeForce 6800 Ultra beats the X800 PRO by any decent amount. And the X800 XT came out as the fastest card, by an insignificant 41 3DMarks.

A similar picture emerged in Aquamark 3, where very little changed as the resolution was increased, a sign that the benchmark is beginning to become CPU-bound. This was reinforced by the fact that while the X800 XT and 6800 Ultra were neck and neck at 1280 x 1024 with normal settings on, it was not until we cranked the antialiasing and anisotropic filtering up to 4x that the X800 XT showed a significant performance lead over the other cards.

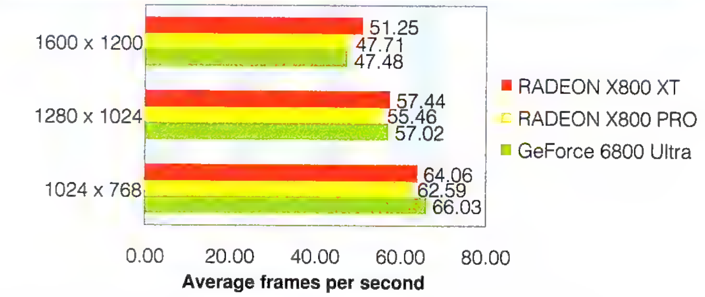
It was only when we threw the shader rich Far Cry at the cards that a difference appeared without AA and AF set, and the X800 XT loved it, delivering silkier framerates than the other cards.

In terms of brute force the X800 XT easily wins the crown of Big Daddy Performance. It lacks the forward looking Shader Model 3.0 support of NVIDIA's lineup, but for the games on the market today, it is unparalleled. If this performance translates to the retail product, then owning one of these cards will shoot to top priority in a lot of people's lives. JG

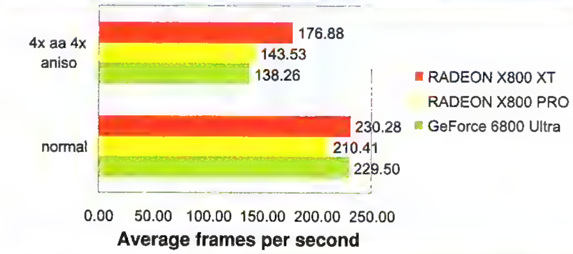
Aquamark 3 – Pixel shader test



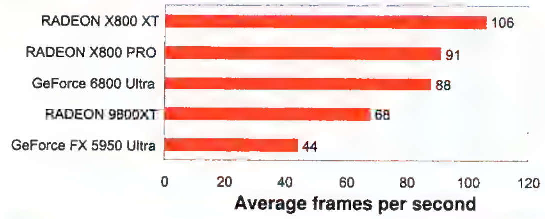
Aquamark 3 – Standard test



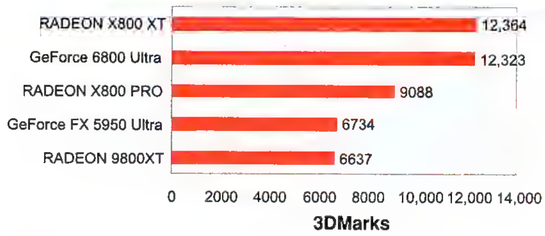
UT2003 – 1280 x 1024



Far Cry – High detail

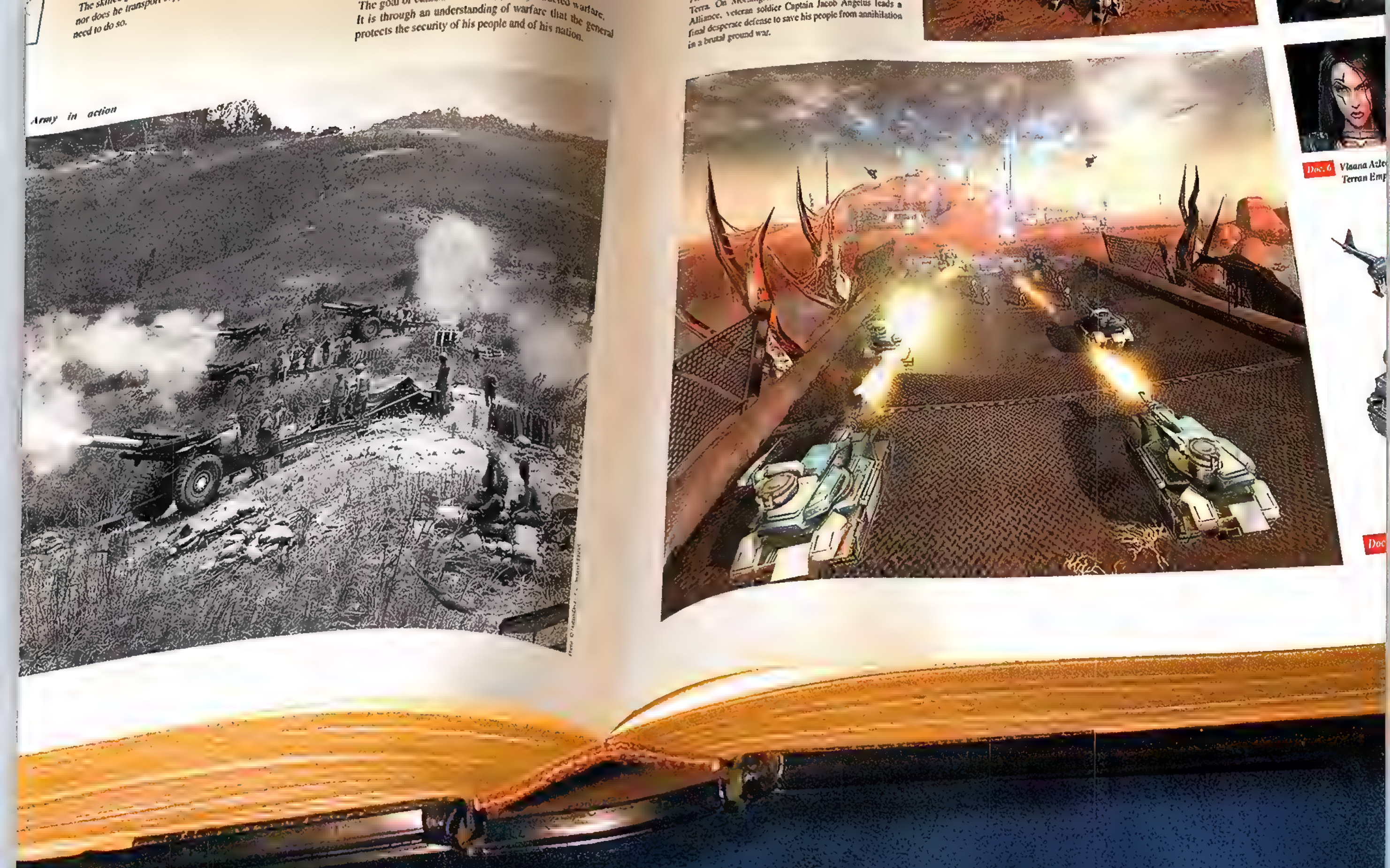


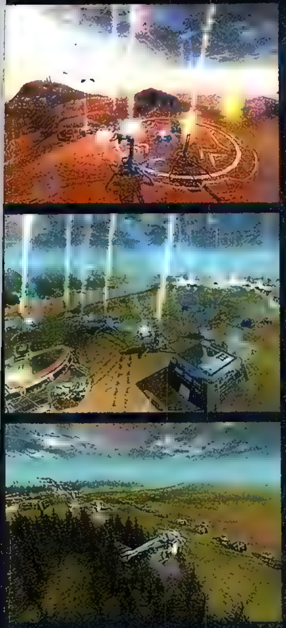
3DMark03



SCORE PREVIEW

While the sinking of the Titanic in 1912 'popularised' the use of SOS as a signal for rescue, it was not the first ocean vessel to use it. SOS is also not an acronym.


nor does he transport
need to do so.
The goal of
It is through an understanding of warfare that the general
protects the security of his people and of his nation.
Army in action
Terra. On
Alliance, veteran soldier Captain Jacob Angelus leads a
final desperate defense to save his people from annihilation
in a brutal ground war.
Doc. 6 Vlaana Azle
Terran Emp
Doc



"Attack your enemy where he is unprepared, appear where you are not expected."

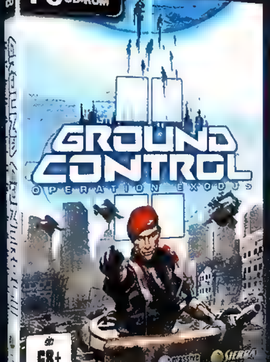
Sun Tzu-The Art of War

Ground Control II: Operation Exodus is an epic real-time action-strategy game that takes your strategic and tactical thinking to the limit. Test your skills as you take the role of Captain Jacob Angelus commanding the hardware-intense Northern Star Alliance or the nano-organic technology of the alien Virons in 24 action-packed missions.

Then test your strategies and tactics against thousands of players online by logging on to Massgate™, an online community system that gives you immediate access to online matchmaking, drop-in multiplay, hi-score ladders, tournaments, chat rooms and much more.

"Ground Control II may well end up being the strategy game of the year"
PC Zone

"We're really looking forward to the fully-finished shell-shocker"
PC Gamer



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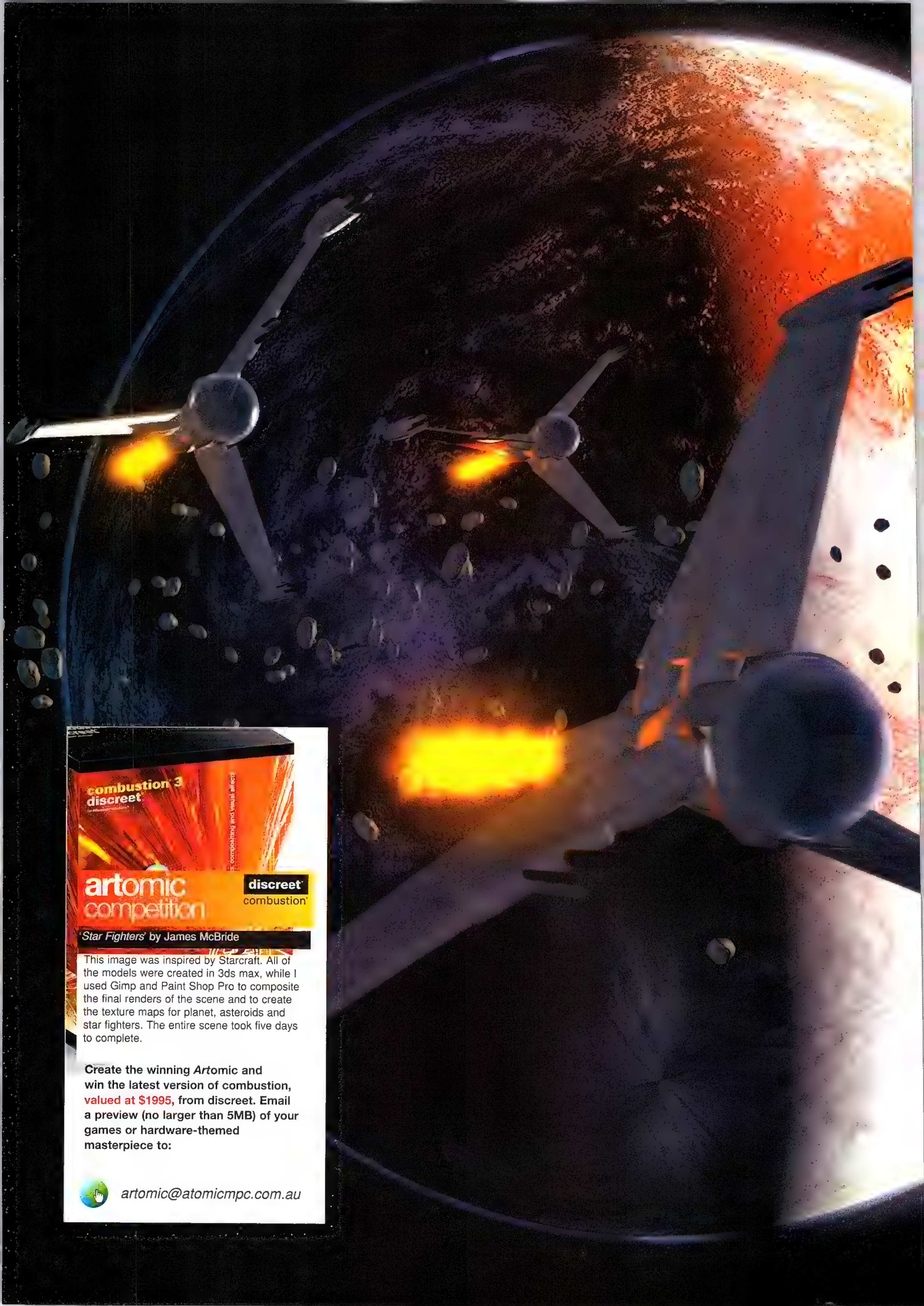


artomic competition

discreet
combustion

'Star Fighters' by James McBride

This image was inspired by Starcraft. All of the models were created in 3ds max, while I used Gimp and Paint Shop Pro to composite the final renders of the scene and to create the texture maps for planet, asteroids and star fighters. The entire scene took five days to complete.

Create the winning *Art*omic and win the latest version of combustion, valued at $1995, from discreet. Email a preview (no larger than 5MB) of your games or hardware-themed masterpiece to:

artomic@atomicmpc.com.au

Games

Valve: The Masquerade

Logan Booker is not the only person to be sucked dry by Valve's BS.

Right now, Valve should be engaged in a fierce battle to deal with – and if necessary, absorb – the collective angst the gaming community and industry has directed at it in order to protect what little credibility it has left. Unsurprisingly, Valve has yet to organise a coherent defence, short of lame forum posts and shifty tirades on shafty shader performance.

Despite how disinterested you may be in Half-Life 2, Steam or even video gaming in general, the company's ham-fisted approach to PR and its equally meat-handed response to far-reaching and potentially devastating dilemmas could raise the eyebrow of even the most pessimistic of persons, and lovingly persuade those happy optimists to take cover in a corner and strike a disarming, foetal-like pose.

This jaded opinion of Valve's ability to perform is not based in unreality. One only has to look as far as this year's E3, which will be remembered fondly as the event that knocked Half-Life 2 off its mighty pedestal. Perhaps some of the shine was pilfered along with the stolen source code, or its pleasing cover scuffed by a series of fumbled release dates. Whatever the reason, the HL2 movie that arrived to us fresh from the floor of gaming's biggest event just didn't do much to tantalise the undergarments.

Half-Life 2 is looking flat in more than just the graphics department. While the physics are charming and Alyx's facial expressions have redefined people's relationships with electronic devices, the character animation looked arse and the gameplay pox. Compared to the stomping long-legged creatures and phantasmal blue tentacles of last year, Valve's hastily-provided morsel of Source fails to satiate.

In its own underhanded way, Valve has been trying for the past 10 or so months to divert attention away from itself, to lessen the blows it knew would eventually be dealt at E3. The first of these was unintentional, and came in the way of the leaked code. While it put Valve in the spotlight, it also gave it the chance to point fingers and regroup. Next we were handed a presentation on the crappiness of NV30 and its descendents – running on Source, of course – and the respective benefits of using ATI hardware. This was followed by the ATI/Valve voucher fiasco, and when the promised land of Half-Life 2 failed to pop over the horizon within a reasonable time frame, ATI did the smart thing and let manufacturers decide whether they wanted to bundle the vouchers with their products.

Just a few months ago, Fragmaster – webmaster and founder of PlanetHalflife (www.planethalflife.com) – decided to call it quits and leave the website in the warm, greasy hands of GameSpy. His reason: a well-nurtured disillusionment with Valve, and in particular, its CEO Gabe Newell.

Recently, Valve dug into its magic bag and pulled out the original Half-Life and Counter-Strike, redone in Half-Life 2's Source engine. It's hard to argue that the trailers we saw of these weren't nice; but in the end, it's the same crap in a different hat.

The current distraction is Codename Gordon. It's a side-scrolling platformer based in the world of Half-Life. Players control an animated Gordon Freeman as he battles aliens, mutilates security guards, and generally saves the world from the big bad evils of alternate dimensions. This gem is being distributed by the ever-reliable and successful Steam, right to your digital front door. There's nothing wrong with Codename Gordon. It's a nifty idea. It's just a shame it got sucked onto Valve's ever-growing list of potential diversionary tactics.

Valve did its stakeholders the ultimate disservice by misinforming them of the game's release date, where it again vomited blame at someone else – HL2's destined publisher Vivendi – before sucking it up and attempting to tidy the mess. Redemption is too laudable a goal for Valve right now. It should aim for forgiveness and hope that it gets away with it.

In the meantime, the company's loyalists will continue to eyeball the predicted June/July release date, while the rest of us wait for Doom 3.

Everybody loves a realist.

ShortCircuits

Grand Theft Auto: San Andreas is set to be huge when it hits the PS2 in October, and not just in the sales stakes. Contrary to expectations, San Andreas is not a city, it's a state, and the game will spread over three cities, each as big as our much beloved Vice City was. Adopting the vibe of early '90s California, the three screenshots released so far indicate an overall attitude that is straight outta Compton, but this is but a small tease of the variety of locations to come in Rockstar North's much-anticipated game.

Only nancy boys hack to get their hands on a game early. Real men snatch the disc from the E3 show floor. In a daring move, two perps smashed their way through a perspex bubble on Sony's stand and scarpered from the venue with a copy of the Metal Gear Solid: Snake Eater demo that was being shown. Police are looking for two males, aged 19-20. Which during E3 is about as easy as finding a needle in the world's biggest haystack.

id software's eagerly awaited Doom 3 should be winging its way to stores real soon now. But there appears to be no rest for the wicked as word emerged during E3 that id was already planning its next game – an all new title, rather than another exhumation of the Wolfenstein, Doom or Quake corpses.

BUZZWORDIKAN

ARM

Advanced RISC Machines is a company that develops cores for handheld and mobile processors. It doesn't make chips, rather it licenses its designs to companies who then either incorporate them in an Application Specific Integrate Circuit (ASIC).

The *Star Trek* theme song from the original series starring William Shatner and Leonard Nimoy had lyrics.

Pocket change

The Nokia Taco is dead. John Gillooly looks at the new faces of portable gaming.

The announcement of the PlayStation Portable (PSP) concept overshadowed the other mobile gaming moves by Nokia and Tapwave at last year's E3, but this year the competition was a lot heavier. While Sony finally took the wraps off the PSP, it had to compete with the incumbent mobile gaming power of Nintendo's new DS handheld as well as lower profile announcements by Gizmondo Europe and VIA.

These four platforms mark very different approaches to the emerging mobile gaming market, and the products announced strongly leverage the strengths of the parent companies. In the end it will be consumer demand that decides which product will win or lose, but they all have compelling rights to exist in the market.

Sony PlayStation Portable

If we were to lay a few bets on the mobile gaming race, it would be hard to go past the PSP. Sony created the portable entertainment market with the Walkman, it successfully smashed the Sega/Nintendo monopoly in the gaming console sphere, and it owns music and movie studios so it has the content to drive new content distribution methods. And it doesn't hurt that, aesthetically, the PSP is a thing of beauty.

While the PSP will not appear in playable form until the Tokyo Game Show at the end of September, Sony did show prototype designs at E3. The most striking element of the design is the 4in TFT screen, which is based around a 16:9 aspect ratio. The screen is flanked by a digital thumbpad and the familiar Playstation four button controls on the right hand side.

This 16:9 aspect ratio telegraphs the convergence focus of the PSP. Much like the PS2's success being boosted by its DVD playing abilities, the PSP will not only play games, it will also play movies and music that will be distributed on the new 1.8GB UMD discs the device uses as its main media. By creating a new type of media, Sony will obviously hope to bypass the piracy issues that have gone hand in hand with the use of DVD for PS2 media.

Of all the platforms unveiled at E3, we expect the most solid developer support to come for the PSP. All the promo shots so far show it running the much-anticipated Gran Turismo 4, and Sony announced a huge list of developers that were supporting the platform. With this level of potential on the gaming side and the comprehensive digital media functionality, the PSP could well take the world by storm in the way that only Apple's iPod has in recent years.

Nintendo DS

While the Gameboy line of products undoubtedly rules the handheld roost, the new Nintendo DS system is a radical departure from the Gameboy. As the DS moniker indicates, the focus is around dual TFT screens, arranged vertically. The lower of these is a touchscreen, which is designed to be used with a stylus as the main means of control for games.

It is very indicative of the Nintendo gaming philosophy, and completely lacking in the digital media functionality seen in the rest of this new generation of devices. Instead Shigeru Miyamoto and co are crowing about the huge new possibilities of the touchscreen controls, showing off a variety of uses during E3.

This will certainly give rise to some stellar titles and we are curious to see just how widely used this functionality is. It could be

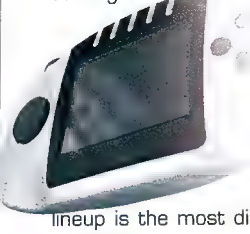
	Game Boy Advance SP	Sony PSP	Gizmondo	Eve	Nintendo DS
Processor	ARM7TDMI	Custom PSP CPU	ARM9	Eden-N CPU	ARM946E-S / ARM7TDMI
Processor Speed	16.7MHz	1-333MHz	400MHz	533MHz	67MHz/33MHz
Graphics	unified with CPU	3D polygon engine	64-bit graphics accelerator	200MHz S3 Unichrome Pro	Combo 2D/3D graphics cores
Resolution	240 x 160 pixels	480 x 272 pixels	240 x 320 pixels	640 x 480 pixels	256 x 192 per screen
Screen size	2.9in TFT	4in TFT	2.8in TFT	4in TFT	3in TFT
Colour depth	32,000	16.77 million	Not specified	Not specified	262,144
Onboard memory	32KB on-die; 96KB dedicated video RAM; 256KB general	32MB main memory and 4MB of eDRA	Not specified	128MB DDR266	4MB
Media support	Cartridge	UMD 60mm optical secure disk and Memory Stick PRO Duo	SD and MMC cards	Inbuilt 1.8in hard drive; Compact Flash	Custom cartridge for DS titles and GBA Cartridge support
Media capacity	up to 32MB	1.8GB UMD; Memory Stick PRO Duo currently available up to 2G	SD and MMC currently available up to 1GB	20GB HDD; Compact Flash available up to 12GB	Not specified
Sound	Mono speakers	Stereo speakers/stereo headphone jack	Not specified	Stereo headphone jack; unspecified speaker configuration	Mono speakers; stereo headphone jack
Multiplayer functions	Link cable	802.11b wireless	Bluetooth; GPRS	802.11b	802.11 with custom protocol
Connectivity options	Link cable	802.11b; USB 2 0; IrDA	Bluetooth; GPRS, USB	802.11b; USB2.0	802.11b
Operating System	Proprietary	Proprietary	Windows CE.net	Unspecified but likely to be Windows-based	Proprietary
Extra functions	GameCube link	Digital Video player (MPEG 4); Audio	Integrated GPS, SMS and MMS capabilities; camera	Component video output; MPEG 4 and 2 decoding; online secure game distribution	Dual screens - one touch screen for use with supplied stylus; Hardware expandability via GBA cartridge slot
Release date	Available now	End of 2004 in Japan, first half of 2005 for the rest of the word.	Not set yet.	Early 2005	End of 2004 (rumoured)
Web	www.nintendo.com	www.playstation.com.au	www.gametrac.com	www.via.com.tw	www.nintendo.com

a problem as the touchscreen is the main differentiator between the DS and the rest of the pack. The system will support Gameboy Advance titles via a rear cartridge slot (but not Game Boy or Game Boy Colour ones – RIP Tetris) and Nintendo has outlined the possibility of DS native games interacting with GBA games in new and exciting ways, much like the GBA and GameCube can.

Gizmondo

Perhaps the lowest profile handheld out there, Gizmondo Europe's Gizmondo handheld has been turning heads in the same way that Tapwave's Zodiac did last year. While it is difficult to judge what sort of developer support is behind the platform, it is an impressive piece of hardware.

At the moment three titles have been announced for Gizmondo, and these are coming from the mobile phone game development community rather than the console gaming sphere that is being tapped by Sony and Nintendo. In fact, the game lineup is the most disappointing part of the Gizmondo package, everything else looks damn cool.



The Gizmondo acts as a media player, has a camera, and works as both an SMS and MMS client. But if a killer app for Gizmondo is to appear, it will most likely tap the inbuilt GPS functionality for location based gaming. Unfortunately it will be a tough sell for Gizmondo Europe to push its handheld into the marketplace without compelling gaming titles; instead it seems destined to be relegated to a similar place as Tapwave's Zodiac handheld – a wonderous piece of technology that will firmly establish its niche but struggle to move beyond that.

Developer Quote of the Month

'We are close to delivering our very high-end next generation graphics technology that targets arcade, PC and console.'

An excerpt from the May 2004 financial statement of PowerVR's parent company, Imagination Technologies.

Eve

Let's get this out of the way first – this console is designed by a bunch called the Ministry of Mobile Affairs, a name which annoys us at some primal level alongside the genetic urge to hunt and to name children Ug. But design wankiness aside, VIA's Eve handheld could well be the dark horse of this race.

Eve is essentially a handheld PC, based upon the x86 architecture and very PC technology. It uses the full range of VIA's technology, from the Unichrome graphics, to the Eden-N CPU and VIA Vinyl Audio. With a 20GB hard drive and a 640 x 480 screen it is essentially a cutting-edge PC from four or five years ago, in handheld form.

This means there's a huge back catalogue of much loved games, without the need for complex porting procedures. These games are to be distributed over the internet through a peer-to-peer network called GameDweller, and there are hefty DRM technologies built into Eve to keep this secure, right down to the use of SIM cards to identify users on the network.

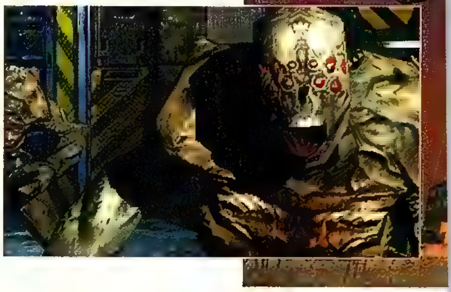
But the big question-mark over Eve is its brutally functional design, which looks like a good solution, but its inherent curvature means it's unlikely Eve will ever fit into the pockets of the masses.

JG

THE USUAL SUSPECTS

James Wang scrutinises E3's most crackling 3D engines and declares one winner and three runners up.

Another year, another E3 and another new engine to drool over. There were lots of games at E3 and, naturally, lots of engines behind them. But in the end, it comes down to the same ones. We'd love to do a list of 'top 10 engines' but we'd be kidding you; with Epic and id software's licensees crossed off, there really aren't a lot with exciting technology out there. The two exceptions are Half-Life 2 and S.T.A.L.K.E.R.

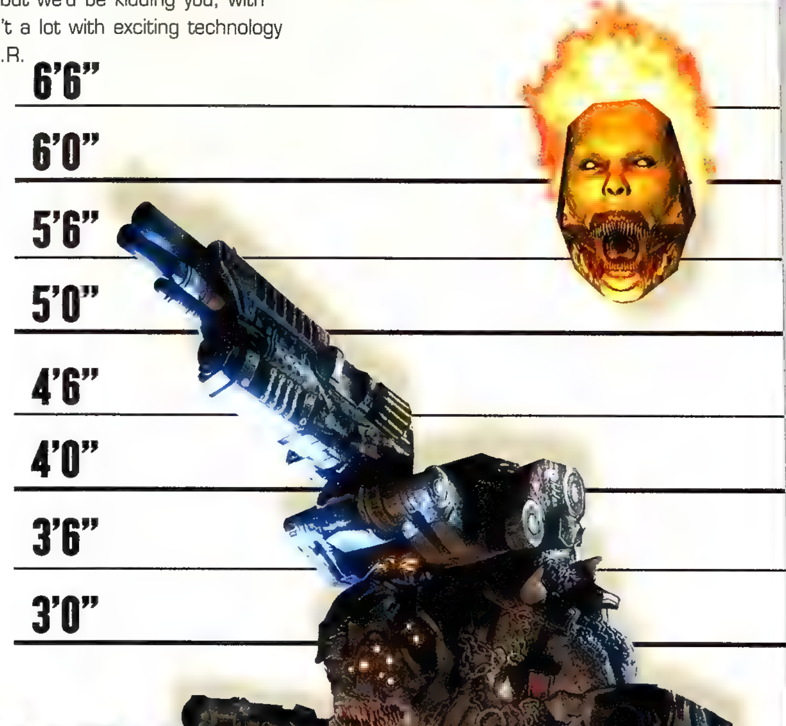

BELOW: It's hard to believe that there's something out that looks better than Doom 3.

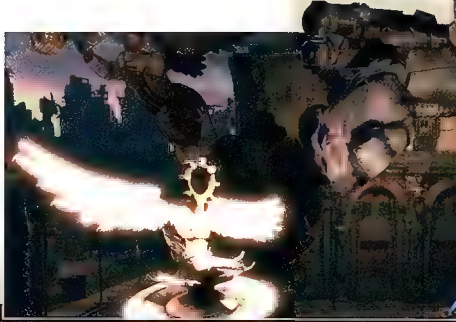
Doom 3

This year Doom 3 was only demoed on the Xbox. The message we're getting is that the PC version is in the final 'completion phase' and should ship in the coming months. Many expressed their frustrations at playing an FPS on a console controller but the verdict remained overwhelmingly positive.

The full dynamic nature of lighting has forced the artists at id to unlearn all the tricks they've accumulated over the years with lightmaps. Since these pre-baked light textures were phased out, understanding how best to manipulate real shadow casting lights has become central to level design. The artists and level designers have done a good job. And a lot of elements borrowed from film have been realised thanks to the new technology. Deep shadows, spinning siren lights, torches mounted to guns, helmets and whatnot paint a picture hauntingly similar to James Cameron's *Aliens*.

Polygon count is noticeably lower than in competitor engines (due to the demands of stencil shadows) but id's artists have done a good enough job on their normal maps to hide most deficiencies. Texture quality is where the Xbox version suffers most – surfaces are often bland and there's a general lack of definition.





UnrealEngine 3

UnrealEngine 3 is no less than three times as unreal as Unreal. The latest work of Epic is quite simply the best interactive graphics we've witnessed.

It was once a shocking thing to provide 'hardware only' 3D acceleration. But Unreal 3 is doing that again, and this time it's saying it doesn't accept anything less than DirectX 9. This is not only shocking compared to the rest of the industry (id included), it is unprecedented. With such a premise set, the developer can write an engine that's purely for today's best graphics cards.

The opening scene of the E3 demo showed a complex setting of gothic architecture, fountains and statues. The whole scene looked like it was taken out of a concept art book for Warhammer, except it was 3D, rendered in realtime on a PC.

In one particular scene, the narrator explains that the original source art had 200 million polygons. Thanks to normal mapping where geometry information is extracted and stored in textures called normal maps, the final scene in the game uses only 1 million polygons. Normal maps, however, rely on dynamic lighting to create the illusion of detailed geometry. This is where the new lighting system comes in.

Like Doom 3, there are no static lights, shadows or lightmaps. Everything is 100 percent dynamic; beams are cast from light to object and shadowed correctly both for self and environment. Unlike Doom 3, instead of using the stencil buffer for drawing hard edged shadow volumes, a soft shadow

BELOW: Half-Life 2, last year's love child, is very much out in the cold.

Features	UnrealEngine 3	Doom 3	Half-Life 2	S.T.A.L.K.E.R.
Static Lighting	Unified dynamic lighting	Unified dynamic lighting	Radiosity generated lightmaps	Radiosity generated lightmaps
Dynamic Lighting			Yes	Yes
Relative Polygon count	Very high	Low	High	High
Dynamic Shadows	True soft shadows	Hard edged stencil shadows	Soft edged shadow maps	Soft edged shadow maps
Normal mapping	Everything	Everything	Selected areas	None
Displacement mapping	Virtual displacement mapping	No	Yes (software)	No
Colour dynamic range	Wide	[0,1] (Higher internals)	Wide [0, 16]	[0,1]
Material shaders	Yes	No	Yes	Yes
Physics Engine	Karma	Custom	Havoc	Open dynamics engine
Unique features	Spherical harmonic lighting, virtual displacement mapping.	GUI surfaces	Fresnel water shader	Sun acts as a global rotating light/surface shader
Why it matters	Pixel perfect unified lighting with soft shadows.	First engine with unified lighting and shadowing.	Seamlessly unified physics and AI.	Superb texture work, art direction and atmosphere.

Half-Life 2 and S.T.A.L.K.E.R.

Half-Life 2 made a modest appearance at E3 and clearly didn't have the impact it did a year ago. Like last year, what was shown were non-playable demos of the game. Disappointingly, much of the elements are the same: striders, the gravity gun and assorted physics demos. A new gizmo-like enemy bot makes an appearance and it looks to be tailor made to cause annoyance and frustration as it rolls about zapping all in its path. A hovercraft vehicle also makes a splash in the local waterways.

Valve is wise in not making an over-the-top promotion video. Overall the atmosphere of Half-Life is well preserved and translates well into the second game. However, we hope Valve moves into high gear for execution.

S.T.A.L.K.E.R. made its first multiplayer debut at E3 with an announcement – unlimited player support. While it's impossible to say how this will pan out in reality, it's good to see these Ukrainian developers pushing the boundaries on all fronts.

S.T.A.L.K.E.R. looks fantastic as usual, with extreme emphasis on day/night transitions and varied weather phenomenon.

As you may have heard, the game is one huge level as far as the eye can see. Sit the camera in the middle of a field and you can literally watch the world go by, National Geographic style; the clouds rapidly change, night falls, rain pours and the sun and moon go around. Dynamic yet serene.

Disturbingly, the game is still said to be in the 'pre-alpha' stage.

technique is used. The degree of blurriness in shadows is based on the distance, so in UnrealEngine 3, two cube maps are interpolated based on this distance to produce shadows that are crisp up close but blurry at a distance.

A huge leap that's made in coding exclusively for DirectX 9 level hardware is the use of 64-bit floating point colour (FP16). This is really a trivial change in the sense that to 'support' it, all you need is to declare a float where you used to declare an integer. But by changing the very basic elements of the engine – in this case the format in which lights are defined – the whole engine receives a consistent and pervasive facelift.

One example involved a demo with a fridge. The room was lit via lanterns on a wall. Without warning, the fridge door opened and instantly the lighting changed – inside the fridge was a lantern that glowed a yellowish-amber. The light cast a whole volume into the room, with the intensity inside the fridge so bright it seemed to be blooming – all thanks to floating point colours.

The pattern of things

We could have mentioned many other good looking engines, but chances are they're based on the same fundamental technologies; what we have here is the cream of the crop.

That said, Half-Life 2 and S.T.A.L.K.E.R. will be the last of their kind – hybrid lighting engines are coming to an end. Like before, Epic and id have paved the way already for the next generation. Very soon, the notion of anything less than full dynamic lighting in first person shooters will become extinct.

JW

Gran Turismo 4: Prologue Signature Edition

John Gillooly finds this prologue lacking in mindblowingness.

PS2

Specs

Developer:
Polyphony Digital
www.polyphony.co.jp

Publisher:
Sony Computer Entertainment
www.playstation.com.au

Distributor:
Sony Computer Entertainment
www.playstation.com.au

Phone:
Sony Computer Entertainment
1300 365 911

☺ One of the finest driving experiences on any platform.

☹ Too short; lacks most of the aspects that make the Gran Turismo series great.

ABOVE: Hamish the Gnome hurries to deliver Mrs Hampton's bulbs.

When it comes to driving games, few names conjure more respect than Gran Turismo, and the upcoming Gran Turismo 4 is one of the most anticipated titles for the PlayStation 2. It marks the debut of a completely new physics model as well as around 500 cars to buy, tweak and race in that inimitable Gran Turismo style. By all indications it looks like a huge title that will have people playing for months and months.

Gran Turismo 4: Prologue is a teaser of sorts, giving us a glance at the new driving model as well as a chance to drive a subset of the cars and tracks that will appear in the full game.

Gameplay is split into two streams, the first is a driving school where you can learn tips and tricks, unlocking new cars as rewards. The second is essentially a cut down version of GT 4's arcade mode.

The new driving model is sublime, especially in the revamped rally races. Graphically this is one of the finest titles to yet appear on the PS2, and the driving school mode gives a great introduction and refresher on the intricacies of GT driving. Which is cool and all, but the niggling question of 'why bother?' just keeps popping up.

While the driving school section is amazingly well implemented, with good voice overs explaining the concepts of driving and intelligently designed challenges, you can chew through the lessons in a few hours.

Even though Polyphony Digital are the kings of the driving simulation, without the ability to tweak your cars the arcade mode with its five tracks does not exactly hold your attention for long.

The cars are still fun to drive, and there are plenty to choose from, but when compared to the promise of the full GT 4 game it seems rather pissweak.

Gran Turismo 4: Prologue is a fun way to spend a day, but all it really does is give a taste of things to come late this year when Gran Turismo 4 arrives. The signature edition comes with a making of DVD as well, which is cool.

If any other developer tried to release a title that was so content-poor they would be laughed out of their publisher's office. Gran Turismo 4 is shaping up to be something mindblowing, unfortunately its Prologue is underwhelming.

SCORE 5/10

V8 Supercars 2

Ben Mansill makes a pass up the inside lane around the A1 ring.

PC

Specs

Developer:
Codemasters
www.codemasters.com

Publisher:
Atari
www.atari.com

Distributor:
Atari
www.atari.com

Phone:
Atari
(02) 8303 6800

☺ Moreish gameplay; complete licensed V8 series; 21 cars on-track; competitive but not annoying AI.

☹ Some quantity-for-quality compromise in track and physics detail. Broadband essential for online.

ABOVE: V8 thunder at Bathurst. You'd want the game for that alone.

Sim-purists like to miff about Codemaster's racers. While the game boasts a 'Sim' mode, and even more audaciously, a 'Pro-Sim' mode, its cars never come close to achieving the fidelity we've seen in Grand Prix Legends, or more recently, the remarkable GTR. But that's cool. It's clear that any claims of being simmy are coming only from Codie's marketing dept. The blokes who actually made this game have comfortably achieved their goal of creating a highly polished and massively scoped *racing game.*

Out of the box you get tremendous value for your 89 bucks. There are at least 45 tracks – possibly more after unlocking. They're grouped into 30 championships, which are all official licences.

The big one for us is obviously the AVESCO Supercars series. One could conceivably buy this game just for the V8s – Atari's marketing dept is certainly banking on that. But with very few exceptions, the non-V8 tracks and cars are beautifully satisfying.

You can race any kind of car on any kind of track if you like too, like Mercedes Truck racing through snowy Alps, if you're inclined, or take the wonderful V8s around the thrilling English ToCA tracks. Makes for great gaming longevity.

Once you get into the groove of the unique Codemasters driving model – which is neither sim nor arcade, it's easy to settle into a different kind of car on an unfamiliar track. This aspect, by design, makes multiplayer just tremendous. There, netcode is solid and it's not hard to find a bunch of Aussies racing endless V8 series online.

Being tough but not impossible is also the backbone for the single player mode, which will throw you around short three-lappers, often asking you to pull a legend last-to first win in anything from an Indy open-wheeler to a WRX in the snow.

As a keeper, V8 2 is definitely worth having in the collection for when you need a satisfying thrash, alone or with friends.

Requirements
800MHz PIII or Athlon; 256MB RAM; DX9.0 graphics card.
Recommended
1.4MB P4 or Athlon; 512MB RAM; RADEON 8xxx/GeForce 3 or higher.

SCORE 8.5/10

○ Plastic water bottles are quite safe to re-use, and do not leach toxins into the liquids they contain.

●REC

MANHU

"THE MOST IMPORTANT VIDEO GAME OF THE LAST FIVE YEARS."
- THE CHICAGO TRIBUNE

OFFICE OF FILM AND LITERATURE CLASSIFICATION
MA15+
[RESTRICTED 15 YEARS AND OVER]
MEDIUM LEVEL ANIMATED VIOLENCE

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Note: This game contains violent language and behavior and may not be appropriate for persons under the age of 15. The story, names and incidents portrayed herein are fictitious. No identification or similarity to actual

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N T
REC
SAVE
"FOR GAME PLAYING ADULTS THERE ARE FEW EXPERIENCES MORE ENGROSSING AND TERRIFYING"
- ATOMIC

PlayStation®2 XBOX PC CD-ROM SOFTWARE

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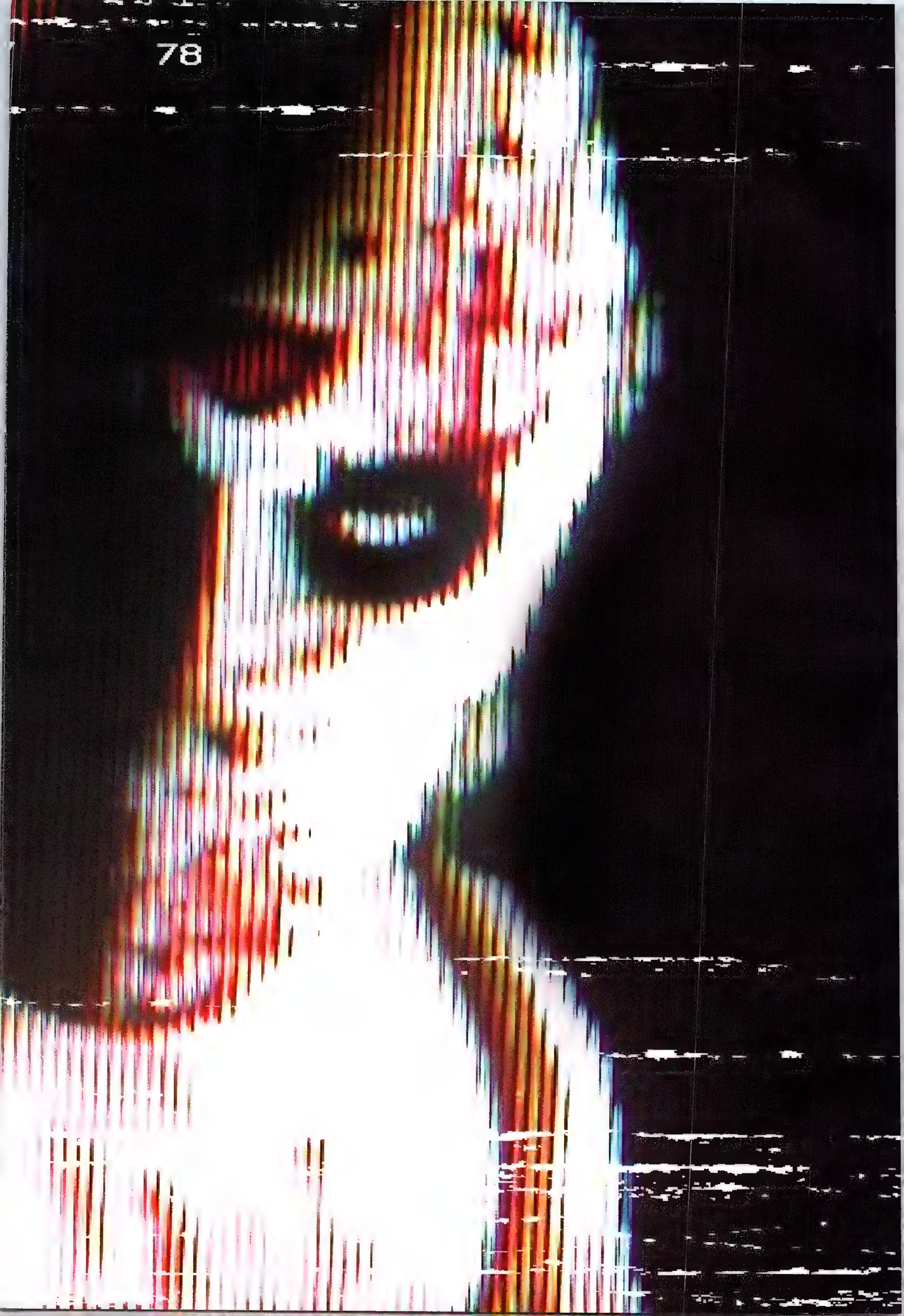

ROCKSTAR GAMES PRESENTS

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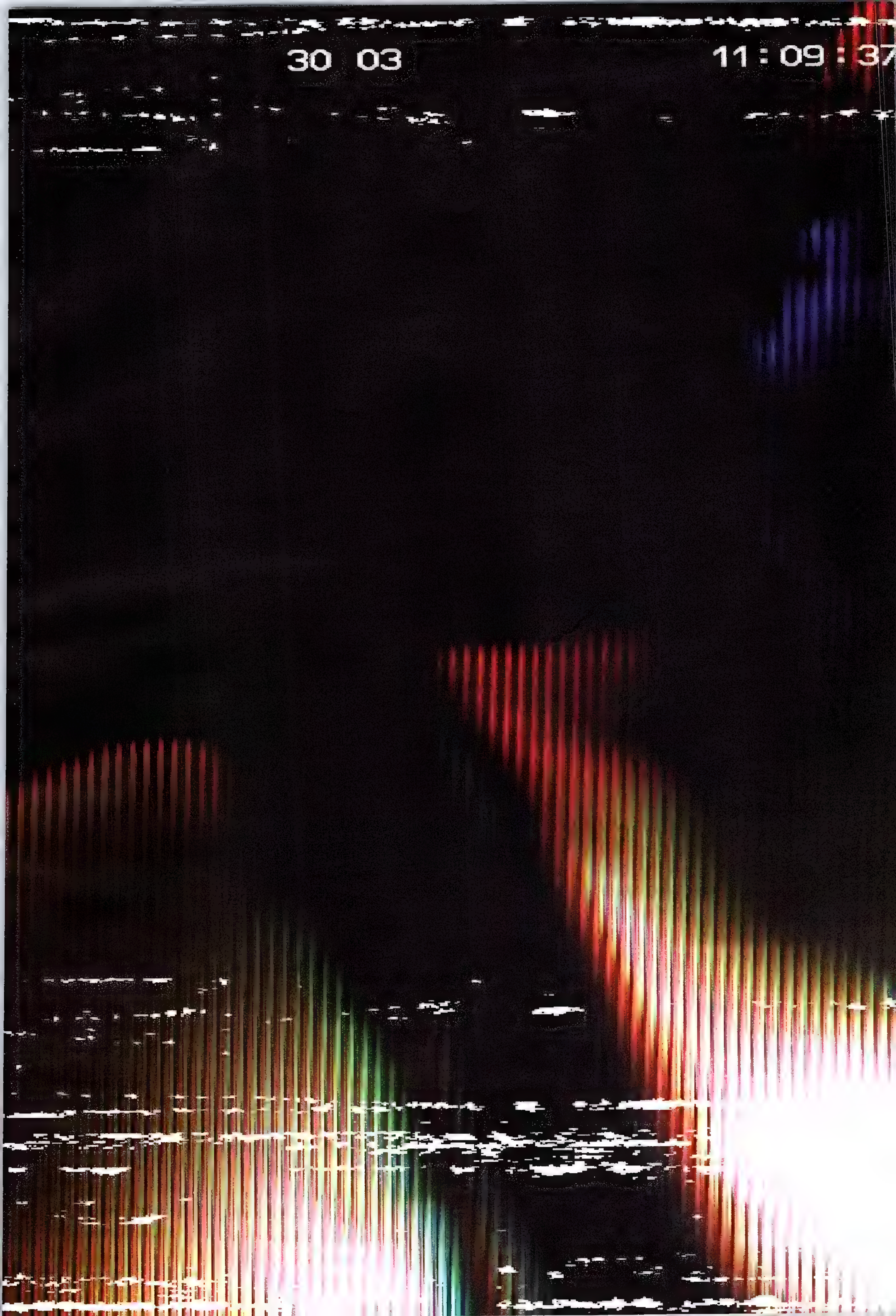
XBOX
OFFICE OF FILM AND LITERATURE CLASSIFICATION
MA15+
(RESTRICTED 15 YEARS AND OVER)
MEDIUM LEVEL ANIMATED VIOLENCE
PlayStation.2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Transformers

John Gillooly wages battle to destroy the evil forces of the Decepticons...

PS2

Specs

Developer:
Melbourne House
www.melbournehouse.com

Publisher:
Atari
www.atari.com.au

Distributor:
Atari
www.atari.com.au

Phone:
Atari
(02) 8303 6800

☺ Optimus Prime! Fast and furious third person romp.

☹ Where are Bumblebee, Jazz and all those familiar faces?

ABOVE: One of the monumental fights against a Decepticon boss.

Gun wielding robots that change into vehicles sit just below robotic boys who have machine guns in their butt in the whole ranking of cool. It has been a long time between drinks however for the Transformers in the gaming stakes; the last games were made for the Commodore 64 (we don't count Beast Wars around here).

This new game is a third person shooter for the PS2; you play as one of three Autobots who have travelled to earth to rescue members of the ancient race of Minicons, which are, unsurprisingly, small Transformers. Of course, the Decepticons are there as well, bringing along suitable cannon fodder in the form of armies of Decepticlones.

With huge environments to explore and flexible weapons loadouts thanks to the Minicon's ability to upgrade and enhance your Autobot, this is a fun game, and a cut above the usual crappy licensed fare that we expect from a title like this. It is at times genuinely hard going, especially when you're up against the Decepticon bosses, but the expansiveness of the environments never becomes too overwhelming, thanks to regular updates from your companions.

The ability to switch between the three main Autobot protagonists is also welcome, as it allows you to choose the best set of skills for the task at hand. Unfortunately only Optimus Prime seems to have survived from the original Transformer cast, but happily the Decepticon ranks still include Megatron and Starscream for your blasting pleasure.

It's about as good looking as a PS2 title can get. We did find it hard to spot enemies at times, especially when trekking through the densely forested Amazon levels, but this is a minor concern.

But while it is a competent title indeed, it just lacks that extra special something that pushes it to the level of exceptional. At heart Transformers is a fairly standard run-around-and-shoot title, you just get the ability to drive around as well. There may not be much more than meets the eye, but it's a fun old romp anyway.

SCORE **8/10**

Rallisport Challenge 2

Like it sideways in the mud? John Gillooly does.

XBOX

Specs

Developer:
DICE
http://global.dice.se

Publisher:
Microsoft
www.microsoft.com/games

Distributor:
Microsoft
www.microsoft.com/games

Phone:
Microsoft
13 20 58

☺ Graphically sublime and genuinely fun rallying experience across a range of events.

☹ Environmental effects work so well they can be damn frustrating at times.

ABOVE: The king of Group B kings, Lancia's Stratos goes skiing.

When the Xbox first launched, one of the graphically outstanding titles was Rallisport Challenge. It put the hardware to very good use, and managed to provide an enjoyable rally experience to boot. Its sequel looks absolutely magnificent – cars get banged up and dirtied during races, environments whip by at breakneck pace and environmental effects like lighting and rain actually play a big part in not only car handling, but in course difficulty as well.

Rather than take the approach of a single rally season, RC2's career mode consists of a series of challenges that you must progress through to unlock cars, tracks and licences that allow you to move to the next level of your career. What is really cool is that actual rally driving from point to point is just one facet of the game. It also lets you take part in tight and twisty rallycross, slip and slide your way through the gentle art of ice racing, power up treacherous mountain roads in the hill climb, and try the tactical one-on-one racing of the crossover event.

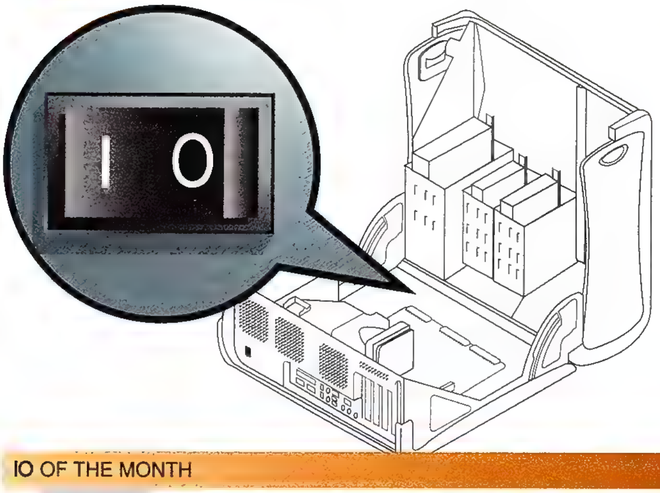
There are different suites of cars in each event, and one of the coolest things about RC2 is that it includes Group B – the class of rally that was so insanely overpowered that it was banned. This allows for some classic cars like the Lancia Stratos, Suzuki's Pikes Peak model Grand Vitara and the Ford GT 70. Cars both look and sound amazing, and the driving model is superb. Which makes for a highly enjoyable rallying experience.

hotaward

RC2 is really the total package. Night driving through a snowy landscape looks and feels terrifying, with only the nattily pixel shaded headlights to help you find your way. Equally scary is cresting a ridgeline late in the afternoon when everybody's favourite ball of flaming gas almost blinds you with its setting brilliance.

It's diverse, it's fun and it provides a wonderfully scaling challenge as you move through the career modes. Rallisport Challenge 2 is an amazingly well rounded game.

SCORE **9/10**



IO of the month wins a Logitech MX700!

Mousies! Lots and lots of little mousies!
io@atomicmpc.com.au

IO OF THE MONTH

ACPI = Absolutely Crappy Performance Interface?

When I was trying to find out why an old swap-meet Socket 370 machine wouldn't power down when I told Windows to shut down, I found it was because ACPI wasn't enabled.

I stumbled over how to enable ACPI when initially installing Windows XP at http://forums.infoprosjoint.net/archive/index.php/t-4744, but I have yet to try that.

In that same thread, I discovered that ACPI in Windows 2000 and XP slows your system down. It was commented that home systems should have all forms of ACPI disabled for optimal performance. The writers rave about stability and smooth performance increases without ACPI.

Is there any truth to this? Is the performance improvement significant enough to warrant me disabling ACPI on my Athlon XP 1800+ system?
Calvin Sy

First up – you don't have to do a from-nothing reinstall to enable (or disable) ACPI on a Win2000 or XP system. You can disable ACPI and then reinstall Windows over the top of itself (a 'repair' install). That won't wipe all the stuff you've set up in the non-ACPI install.

The thread you link to is not exactly a mine of accurate information. Disabling ACPI certainly doesn't make more IRQs available, for instance; on the subject of what actually happens, you may find the last couple of letters in www.dansdata.com/io023.htm interesting.

ACPI also has a trivial impact on system performance, unless something is wrong.

The usual way in which something goes wrong is that ACPI interrupts *do* start taking up a big chunk of your CPU time, because far more of them are being done than is necessary. A BIOS update can fix this problem on some motherboards; on others there's nothing for it but to disable ACPI.

But if the Processes tab of Task Manager doesn't show something like a pair of 'Time Placeholder' tasks taking up a big block of CPU time, you don't have this problem.

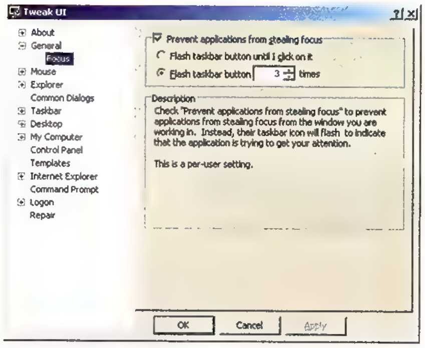
Cold steel

I was looking at buying a new case. I know that most aluminium cases will be lighter than steel ones, but is it true that aluminium cases will be cooler than steel? If there were two identical cases with the same components/cooling, except one was aluminium and the other steel, would the aluminium one be cooler?
Bill Nguyen

Yes, the aluminium case would be cooler, but not by enough to matter. Aluminium is a much better thermal conductor than steel, which can help keep hard drives a bit cooler (because they often don't get a lot of airflow) and *will* allow a small amount more heat to be disposed of to the outside air, but compared with the cooling from the ventilation fans, case conductivity is unimportant. A steel case with the same number of fans and vents as an aluminium one will be, for all practical purposes, just as well cooled.

Attention theft

How can I stop Windows from switching focus to new windows? Like whenever an ICQ message is sent it switches to that window, even if I'm typing in another. Or when something pops up. I don't know how I've avoided accidentally installing GAIN.
Nick Wannop



☑ Prevent applications from stealing focus
○ Flash taskbar button until I click on it
● Flash taskbar button 3 times

Description
Check "Prevent applications from stealing focus" to prevent applications from stealing focus from the window you are working in. Instead, their taskbar icon will flash to indicate that the application is trying to get your attention.

This is a per-user setting.

ABOVE: Also helpful for preventing great big Photoshop lasso operations being terminated halfway through.

You can't *completely* prevent it, but you *can* prevent most apps from doing it, by using good old Tweak UI.
Tweak UI for Win95 to Win2000: www.microsoft.com/NTWorkstation/downloads/PowerToys/Networking/NTTweakUI.asp Tweak UI for WinXP: www.microsoft.com/windowsxp/pro/downloads/powertoys.asp

You want the General | Focus options.

If there were two identical cases with the same components/cooling, except one was aluminium and the other steel, would the aluminium one be cooler?

Although a popular misconception, the word 'nylon' is not a result of mashing together 'New York' and 'London'.

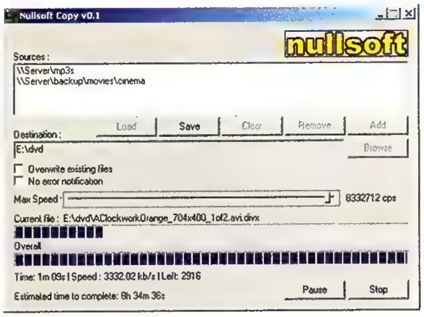
Leech-only LAN

I have an idea about how to solve a problem that all LANners (well, probably all of them) get, but I don't know how to implement it.

When I play a network game, and somebody else leeches off me (er, just all my really cool open source music, of course), terrible lag occurs as a result.

Instead of just disabling file sharing on that network card, could it be fixed if I used two network adaptors, and bound one to gaming and one to file sharing?

James Battams



Sources :
\\Server\mp3s
\\Server\backup\movies\cinema

Destination : E:\dvd

☐ Overwrite existing files
☐ No error notification

Max Speed : 8332712 cps

Current file : E:\dvd\AClockworkOrange_704x400_1of2.avi.divx

Overall

Time: 1m 09s | Speed : 3332.02 kb/s | Left: 2916

Estimated time to complete: 8h 34m 36s

ABOVE: Is there anything Nullsoft *can't* do?

You're talking about load balancing via link aggregation and/or trunking, which won't work right without a special switch that understands that single nodes on the network can receive data at more than one MAC address. Typical cheap LAN party switches are not trunking-aware. And even if you're on a big old corporate network, trunking probably *still* won't work, if people have been hooking up to it in the usual *ad hoc* LAN party style, when the LAN is officially declared complete as soon as everyone can ping everyone else.

Gigabit Ethernet can solve this problem, provided you've got a gigabit connection to a switch (possible, but not very likely, at the average LAN party today) and there's only a regular hundred megabit (Fast Ethernet, 100BaseT) connection to the leeching machine (or the machine you're leeching *from*). As long as that other machine isn't running the game server you're playing on as well, and as long as nobody on that other machine is trying to *play* a game, nobody will be discommoded if you suck data down the Fast Ethernet pipe into your wider gigabit pipe as quickly as you can. Your pipe to the switch won't be saturated unless you decide to leech from a few people at once.

Actually, most PCs with gigabit Ethernet *can't* saturate a gigabit pipe, because the plain PCI bus that most gigabit adaptors are plugged into can't shift as much data per second as the gigabit link can. Disk speed can be a limiting factor as well; this can be a good thing for your problem, if it turns out that disk speed at both ends of the leeching connection bottlenecks the transfer enough that there's spare bandwidth for your games.

A better solution, if you can get people to use it, is Nullsoft Copy (www.nullsoft.com/free/nscopy/), from the makers of Winamp. NSCopy is a directory-leeching program (it doesn't do individual files) that can be throttled to the speed of the user's choice. NSCopy lets you prevent your own leeching from stuffing up your gaming experience, but if everybody doesn't use it (or if they wind it up to its maximum Spaceballs gone-to-plaid speed) then you can still end up with links being saturated here and there.

In case you're wondering, the Quality of Service packet scheduler in NT-descended Windows versions won't help you much, unless your games are QoS-aware (which I doubt). QoS reserves a certain amount of connection bandwidth (by default 20 percent) that'll always be available to, and shared between, QoS-aware programs, if any are running. Since I don't think games *or* Windows file transfers will know anything about QoS, though, and since lots of WinXP users disable the standard QoS Scheduler (www.theregister.co.uk/2001/11/29/winxp_steals_your_bandwidth/), it's a waste of time. All it does is make the pipe your activities *can* use thinner.

Dirty, dirty monitor!

Why is it that CRT screens fuse dust onto the wall? I recently purchased a 21-incher and after a month of Playstation, it seems I have textured wallpaper.

Jordan

CRTs produce a lot of positive ions (so do various other high voltage electric devices, like laser printers and photocopiers, for instance). Dust near highly charged things gets charged itself (usually by contact with the faint ion breeze from the device, not with the device itself), and is then prone to stick to anything that's got a relatively opposite charge. This includes the walls near the CRT, which are neutral, but negative compared with the positively charged dust.

The way this happens causes dust to cake up and look as if it's been 'ground in', producing a dirtier look than you'd get from ordinary dust accumulation – especially on vertical surfaces, which of course normally have no dust on them at all.

The plastic casing of a CRT monitor (or TV, but they're not usually beige and so don't show the dirt as much) will also accumulate crud this way. A CRT that's been turned on seldom or never will, all other things being equal, be much cleaner than one that's been running 24/7.

The dirt isn't *really* ground in, though; it should be fairly easy to remove from painted and plastic surfaces with a damp cloth.

Another dream crushed

I was wondering if a box exists that I can plug a legacy PCI card (a special TV-out card) into, and then connect it to my laptop via USB. I've had a look on the net, but I can only find PCI cards that provide additional USB ports, not the other way around.

Craig

Sorry, but there's no such thing. Even USB 2.0 doesn't have enough bandwidth to do the job – 480Mb/s for USB 2, versus something like 1056Mb/s for PCI. So no such device can be created.

Blue and white striped apron time

I've got a motherboard that I would like to stick in a one unit rack chassis. The problem is that it has a vertical audio block on it, which won't fit. Would cutting this vertical audio block off of this (or any?) motherboard add any instability to the system?

Kirk

No, it should be fine, provided you don't damage the board in the process. Actually, you'd probably be fine even if you ended up shorting the audio traces on the board.

If you want to do this properly, though, you should desolder the thing. If it's some invisible-glue surface mount jobbie then that might be a problem, but connector blocks are all still traditionally mounted with (relatively) fat pins through holes in the board, to my knowledge, so you shouldn't need anything special to remove them. Melt solder with medium-heat iron, remove solder with desoldering braid or a solder sucker, and you should be able to lift the connectors right off. DR

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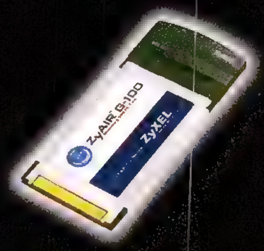

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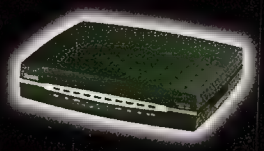

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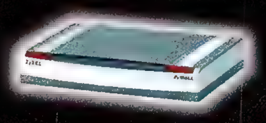

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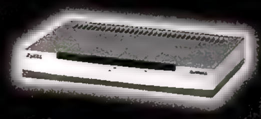

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Ever been limited by your unlimited service? Simon Peppercorn tries to fix that, finding that even at 28.8k, the net can still be useable – just.

This month, we are aiming to help those Optus broadband customers who find themselves capped at 28.8Kb once they hit their monthly allowance. However, the tweaks can apply to network users generally, so read on.

As you would have all experienced, the alleged 28.8Kb connection speed that Optus throttles you to is barely enough for email and/or instant messaging and not much else. Even by changing your browser setting to not display images, most web pages don't load, timeouts are frequent, and sustained download speeds from any source dwindle down to barely negligible transfer rates. Optus offers an unlimited service, but forgets to mention the bit about being unusable.

To be fair, it isn't the fault of the service provider that TCP as a transmission protocol, has a number of failings of its own, contributing to the problem. It isn't as much an issue of raw speed, as a problem of flow control, and the orderly transmission of data. So we need to encourage TCP to better manage the way it sends and receives data packets in the first place.

In a TCP/IP network, a packet of data is not sent until the previous packet has been received and acknowledged. If the sender doesn't receive the acknowledgement within a predetermined period of time, TCP assumes the packet is lost and the packet is resent.

A lost packet is not always the result of network congestion, or hardware problems however, so it can actually be a very inefficient way of delivering data.

Fragmentation of data is the process of breaking larger chunks into smaller chunks, in this instance to allow for physical network limitations. In a TCP/IP network, when devices with differing Maximum Transmission Unit (MTU) settings talk to each other, the data packets get chopped up to suit the device with the smallest MTU. At the receiving end, the fragmented packets are buffered, where they are reassembled and the data stream is reconstructed. If all fragments of the packet are not received by the timeout, the complete packet is discarded, the acknowledgement is not sent and the packet is retransmitted.

To cut to the chase, it has been discovered that if you've been capped by Optus to 28.8Kb the optimal MTU setting is 576. ie smaller packets = smaller fragments = less timeouts and retransmissions.

There are a bunch of utilities that Google will lead you to, to make these changes for you, but it is also simple enough to do it yourself within the registry. Open regedit and browse to: HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\[Adapter ID] If it doesn't exist, create a new REG_DWORD value called MTU and give it a value of 576.

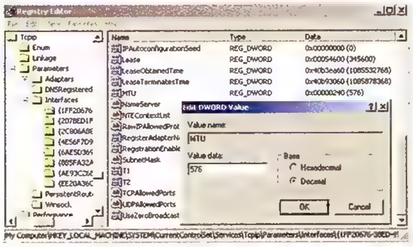
Since we are in the mood for fooling with our MTU settings, there are a few other tweaks we can perform while we are there.

Various remote networks operate at different MTU speeds, so if we tell Windows to auto-detect the remote MTU it can adjust its own settings to match. This should help avoid dreaded packet fragmentation and the associated performance problems. To enable this, we need to create a key called EnablePMTUDiscovery at HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters and give it a value of 1. To turn it off later, just change that value to 0.

Combining these tweaks in terms of our Optus broadband connection, remember that turning off the Path Maximum Transmission Unit Discovery (PMTU) may well result in the default MTU setting of 1500 for LANs or 576 for dial-up networks. A suggested implementation would be to create both registry values, then when you find yourself capped, disable the PMTU key as described above. On the first of the month, when the cap is lifted, re-enable the PMTU.

TCP/IP overhead

We can also better manage TCP/IP overhead by specifying how much data, in bytes should be transmitted, before an acknowledgement is sent. This is a simple matter of changing the window size. Create a DWORD registry key called TcpWindowSize at HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters. Give it the value of the maximum number of bytes a sender can transmit before the acknowledgement is sent. Ideally, this should be an even multiple of the TCP maximum segment size (MSS) which is usually the MTU – 40. The default for Windows 2000 is 17,520, but a value of 16,000 should help the capped user. With a lower window size, less data is required to be buffered and the sender shouldn't timeout waiting for the acknowledgement. The trade-off being increased traffic and slower through put.



Name	Type	Data
IPAutoconfigurationSeed	REG_DWORD	0x00000000 (0)
Lease	REG_DWORD	0x00054600 (345600)
LeaseObtainedTime	REG_DWORD	0x40b3ea60 (1085532768)
LeaseTerminatesTime	REG_DWORD	0x40b93060 (1085878368)
MTU	REG_DWORD	0x00000240 (576)

Value name: MTU
Value data: 576
Base: Decimal

My Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\{1FF20676-38ED-

ABOVE: We say to you, tweak your MTU. Maximise your transmission units!

Increase performance

This next part is not really going to help you when capped, but can produce greater transmission performance generally.

TCP/IP uses a portion of RAM for buffering packet data in a router packet queue. Each buffer is 256 bytes long. When a packet is longer than the buffer length, multiple buffers are used. The default value is generally 74,240. This allows 50 packets of 1480 bytes each. By toying around with the forward buffer memory, we can increase transmission efficiency. Within HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters, create a key called ForwardBufferMemory. Create a DWORD value for the amount of memory you want to allocate, in bytes.

Optimally, the value you want to set here is from 50 to 100 times the size of your MTU. In other words, if your MTU is set to 576, then consider a value of 57,600. If you divide this by 256 (the size of the data buffer) you get a nice whole number of 225. If you had an MTU of 1500, however, and you tried to set the ForwardBufferMemory to 150,000, it would result in 585.9375 packets in the data buffer. Instead, it would be better to round up to 586. Multiplied by 256, we get 150,016, so we would use that value instead.

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Use Linux! Not only will you look cool, you'll be able to use all these awesome tweaks, courtesy of open source guru Peter Sbarski.

If you've ever had the pleasure of installing Gentoo you would have come across `CFLAGS` and `CXXFLAGS`. These flags typically specify optimisation and customisation options which are used to modify and enhance programs built from source code.

The reason these flags are beneficial is because most major Linux distributions are simply not optimised enough to deliver the best possible result for your current architecture. For instance, Red Hat is basically optimised for a 386 so when you compile programs under it, they also are optimised to work under a 386, ignoring the fact that you may have an Athlon 64 or a Pentium IV. By using the following flags you can force the GNU Compiler Collection (GCC) C and C++ compiler to optimise the programs you are going to build from source. One word of caution though, using certain combinations of flags can sometimes bring on stability problems. If you suddenly find that programs crash more than usual, recompile them again without the flags and see if there is an improvement.

The `CFLAGS` definition can be declared as follows (note that you can add as many or as few options as you want):

```
CFLAGS="-O3 -pipe -funroll-loops
-ffast-math -fomit-frame-pointer
-malign-double -fforce-addr
-march=<your cpu type>"
```

To make `CFLAGS` global add it to `/etc/profile`. Just make sure you add it above the line which begins: `export PATH PS1 USER ...`

The `CFLAGS` definition will affect how your C programs will be compiled. If you want to use different options for C++, you will need to declare `CXXFLAGS`. If you just want to keep the same option for C++ as you do for C, add `CXXFLAGS="${CFLAGS}"` under the `CFLAGS` definition.

Finally, to the line `export PATH PS1 USER ...` add `CFLAGS` and `CXXFLAGS`.

The options specified in `CFLAGS` and `CXXFLAGS` have the following meaning:

`-O3`: the letter O (not zero) stands for optimise and the number represents the level of optimisation we want to achieve. The lowest level is 0 and the highest level is 3. Compiling your program with a higher optimisation level will make it perform a lot more efficiently and faster. Unfortunately the trade-off is that the size of your compiled binaries will grow the higher the optimisation level you select.

`-pipe`: the pipe command forces the compiler to use the pipe mechanism rather than temporary files during various stages of the compilation.

`-funroll-loops`: this command performs loop unrolling. It optimises loops whose amount of iterations can be determined either at compile time. There is another command `-funroll-all-loops` which performs loop unrolling for all loops. In some cases, however, it can actually slow things down so it is better and safer to stick with `-funroll-loops`.

`-ffast-math`: this option will ignore some ANSI and IEEE rules (not a good thing) to optimise code. For instance the compiler will assume that all arguments to `sqrt` (square root) are non-negative and bypass a check for negative numbers. This option can be effective but also quite dangerous.

`-fomit-frame-pointer`: this directive allows the compiler to free a register by not keeping a frame pointer when it can. This option makes debugging nearly impossible, unless your architecture supports debugging without a frame pointer, but the benefit is much better performance.

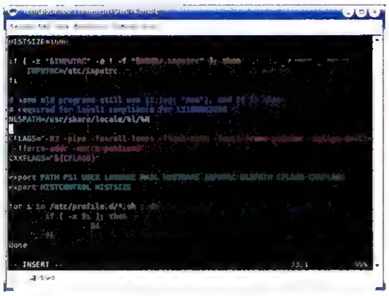
`-malign-double`: this command forces GCC to align doubles and long doubles on a two-word boundary. This makes the code run faster but takes up more memory.

`-fforce-addr`: this instruction makes the compiler copy address constants into registers before doing any type of arithmetic on them. This produces better code.

`-fforce-mem`: this directive works in a similar way to `-fforce-addr`. It copies memory operands to a register before performing any type of arithmetic.

`-march=<your cpu type>`: The `march` option needs to know your CPU architecture. Some possible options are: i386, i486, i586, pentium, pentium-mmx, pentiumpro, pentium2, pentium3, pentium4, k6, k6-2, k6-3, athlon, athlon-tbird, athlon-xp or athlon-mp. See http://gentoo-wiki.com/Safe_Cflags for more options. This flag will optimise your program for your architecture but know that your binaries may not work on other computers.

There are a lot more options you can use to perform further optimisations. If you are interested send us a note to: linuxtweaks@atomicmpc.com.au and we may revisit this topic at a later date.



ABOVE: Setting CFLAGS to optimise performance.

Brace Expansions

In BASH and many other shells brace, '{' and '}', expansions can be used to do multiple things at once. If you know how to use brace expansions they will definitely make you more productive, especially, if you have to constantly repeat certain actions.

For instance, say you want to create two directories and inside each of these directories place another three directories and finally inside each of these three directories place one more. Here is how you can do it:

```
mkdir -p
{atomic,pcauthority}/{contacts,info
rmation,ideas}/backup
```

Imagine you have five directories called junk1, junk2, etc... You wish to delete all files in each of those five directories. With brace expansions you can do it all in one hit:

```
rm -f junk{1,5}/*
```

Braces can also be nested. Assume you have six files called fileW.txt, fileX.txt, fileY1.txt, fileY2.txt and fileY3.txt and fileDontCopy.txt. You can quickly copy the first five files to another directory by using this expression:

```
cp file{W,X,Y{1,2,3}}.txt
~/directory/
```

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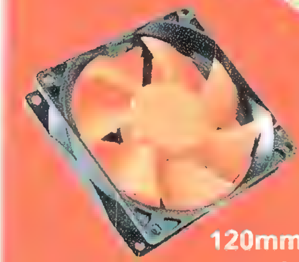

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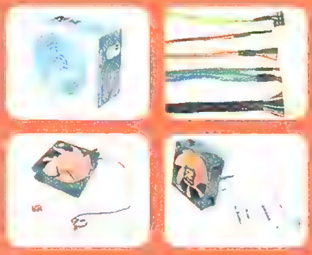

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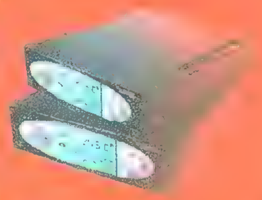

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☐ 120mm aluminium filter, $12.50
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Other suppliers will stock similar items at competitive pricing, however, I wanted these particular parts for their aesthetics.

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☐ 90mm x 45-degree PVC Y-joint, $9.00
☐ 90mm PVC IP (inspection point) $2.50
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The *Atomic* tower of freeze

OK, so it's not the tower of power. But, it is the tower of cooling – the ultimate construction, perfect for all your freezing needs. Ron Prouse shows you how to erect one.

When it comes to cooling, you have to hand it to the skin that you live in. As the largest organ of the human body, not only does it keep everything packaged neatly together (in most cases), but it is also responsible for another vital function – maintaining a relatively stable core temperature. When external temperatures rise, the release of sweat and resultant process of evaporation creates an environment of heat exchange, helping to regulate the buildup of heat in our bodies.

Bloody amazing, but you are probably wondering, 'What does a sweaty armpit have to do with cooling my PC?' The answer is in that pivotal word – evaporation.

Evaporation is one of the most simple and economic methods of cooling, in terms of the least amount of energy required to sustain the process. In fact, evaporative devices such as cooling towers are commonly used in industrial applications to provide significantly lower water temperatures than can be achieved with 'air cooled' or 'dry' heat exchange units such as radiators.

The process that we are looking at here is an example of an evaporative cooling tower, or to be precise, a 'splash-fill open circuit' system. In an open circuit system, coolant (usually water) is used to collect and transport heat from a source (such as a CPU water-block) and pumped to the top of the tower. Air is passed through a spray of the coolant passing down through the tower, allowing a small percentage of the water being cooled to evaporate into the moving air stream.

The heat from the water spray is transferred to the air stream, raising the air temperature and its relative humidity to 100 percent, and the 'contaminated' air is then discharged into the atmosphere. The energy transfer provides a significant cooling effect to the remainder of the water spray, which is collected at the bottom and recirculated to begin the process again.

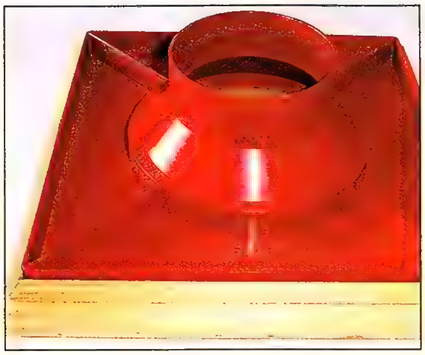
ABOVE: Water and electronic gizmos don't mix. Just like in those science movies where mogwais and water don't mix.

Evaporative cooling can easily achieve coolant temperatures several degrees below ambient air temperature, which will result in performance that is far cooler than traditional water-cooling methods.

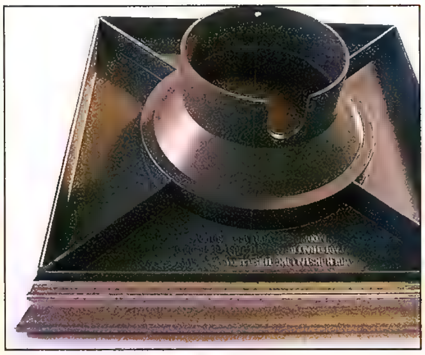
The only real drawback to a cooling tower system is that it is a 'significant loss' concept; obviously, as a percentage of the coolant is constantly evaporating, there is a corresponding loss in the overall volume of coolant in the system – the amount of loss will vary with coolant and ambient air temperature and the atmospheric humidity.

Because of this 'wastage', the amount of coolant needs to be monitored and replenished to maintain peak performance and minimise the possibility of running the system dry (which is a very bad thing!). To help overcome the frequency of 'top-ups', it's a good design ploy to make sure that the reservoir section of the tower holds a large volume of water that can be checked easily.

01 Being tall and top-heavy, it's important that the cooling tower has a large base to give it stability – heavier is better. The MDF base is cut to the same size as the PVC IP fitting and the edge moulding cut at 45° angles and fitted.



02 The decorative moulding strips are used to secure the PVC IP fitting in place. The IP fitting not only serves as a base, but it will also help contain any small leaks that might occur when topping up the coolant level.

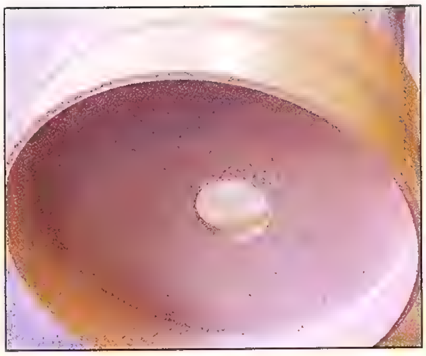


03 The wooden base is sanded and painted to keep it waterproof. A section is removed from the IP fitting to allow the fitting of the return hose, and the base painted with vinyl dye to make it look less like a garden fitting!

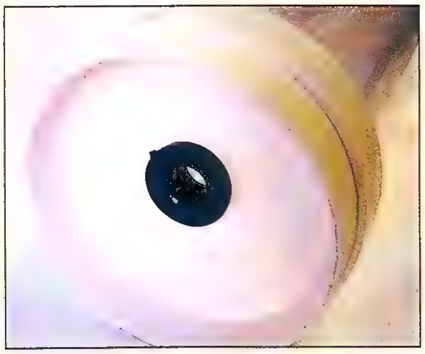
04 The acrylic tube used has an 88.5mm outside diameter (OD), with a 1.75mm wall thickness and is 800mm long. The easiest method of cutting is to use a mitre box, and slowly cut and rotate the pipe at the same time – only cutting through one side at a time.

05 The 88.5mm OD of the tubing means that it has to be attached to the 90mm end cap with a 'filling' bonding agent, such as non-corrosive silicon adhesive. To ensure a good bond roughen the joint with fine sandpaper and clean them thoroughly with acetone.

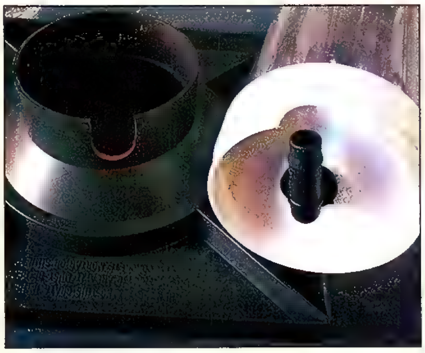
06 Allow enough silicon adhesive to completely fill the gap between the two surfaces, and make sure that the bottom edge of the acrylic tube is completely immersed in a 'pool' of the adhesive. This will ensure a watertight seal under gravitational pressure.



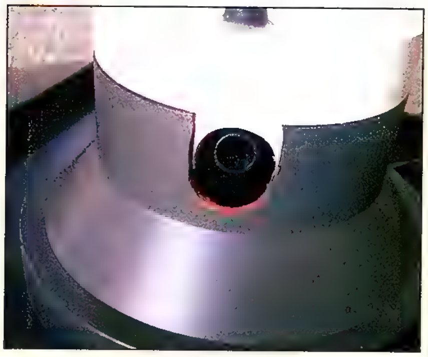
07 Leave the silicon joint overnight to completely cure. The water outlet is positioned on the bottom of the reservoir using a 16mm drill on low speed. Remove any burrs or 'high spots' with sandpaper so that the bonding surface is perfectly flat and smooth.



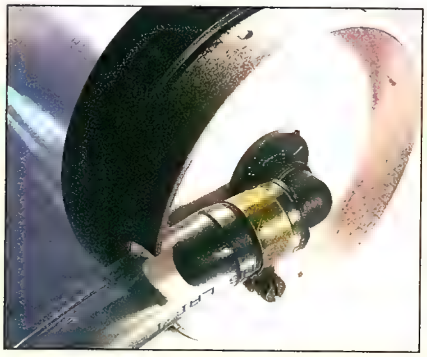
08 The 0.5in ID grommet was sourced from an indoor irrigation supplier and is also glued in using silicon adhesive. Make sure that the outer lip of the grommet is glued securely, as this is where water-leaks will most likely occur.



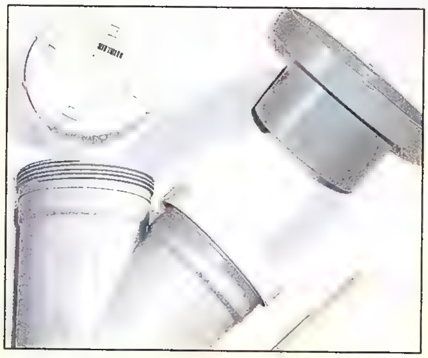
09 Using a file, shape the end-cap so that there is room for the hose to exit through the base section. Using lubricant (spit!) carefully slide the 90-degree irrigation elbow into the grommet, twisting it gently to ensure that it 'beds in' firmly.



10 With the tubing exit hole lined up, drill three equidistant 3mm holes in the overlapping lip so that the two components can be attached with self-tapping screws. The reservoir needs to be detachable from the base to allow for future cleaning.



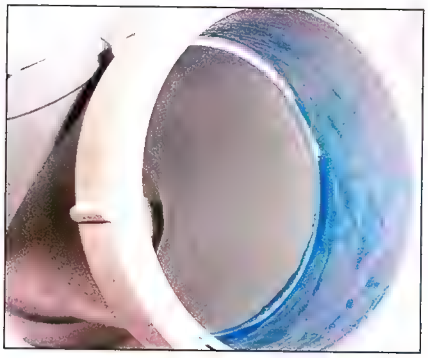
11 With the reservoir complete, the next step is to attach the outlet hose and secure it with a hose clamp. The acrylic tube was masked off and the PVC end-cap sprayed with black vinyl paint to give it a more professional look.



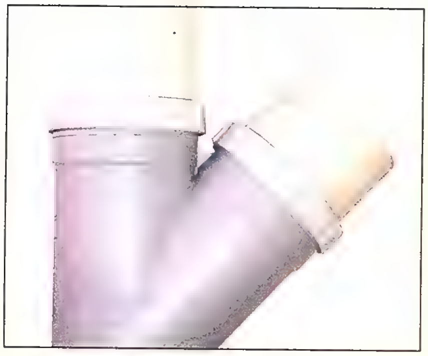
12 The next section of the cooling tower is the heat exchange unit. A 90mm x 45° PVC Y-joint, an IP housing, two end caps and two lengths of 90mm tubing are used to fabricate the housing for the fan and the spray-head.

13 The threaded ends on the Y-piece are unsightly, so they are covered with screw caps, cut out with a jigsaw leaving an opening just large enough to allow the 90mm tubing to pass through. After sanding they can be fitted to the Y-piece.

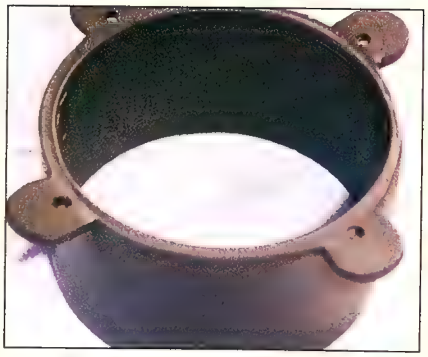
14 A section of PVC tube is cut to 400mm, and another 150mm, to form the main body. Gluing PVC is a two-part process. The first part is to prepare the surfaces with priming fluid. This etches the plastic surface so that the joint has maximum strength.



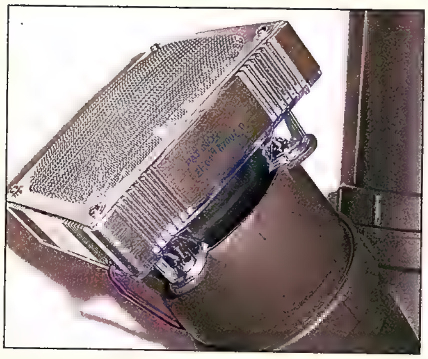
15 After priming, spread an even amount of the PVC glue over one surface, and quickly push the two parts of the joint together. The glue begins to harden almost immediately, so this step has to be performed as quickly as possible.



16 With the components glued together, place the housing onto the top of the reservoir, drill and tap four equidistant holes through the Y-joint flange into the acrylic tube. These screws will add mechanical strength to the silicon joint later. Now paint the housing.



17 The IP housing is cut out with a jigsaw and file, making up 'lugs' that are used as mounting points for the fan adaptor. This component has a 90mm ID, so it will slide firmly into place over the short Y-piece – do *not* glue it on!



18 After painting, an 80/120mm fan adaptor is fitted to the connector and the fan and filter are screwed on. A 3mm hole is drilled through the bottom of the assembly and into the PVC tubing, with a PK screw used to hold it together.

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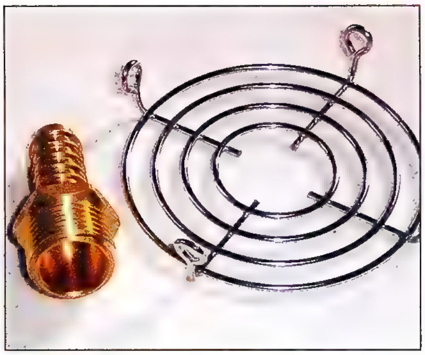
19 The most important component of this type of cooling tower is the spray head. It has to be a low-pressure fitting, with as many small holes as possible.

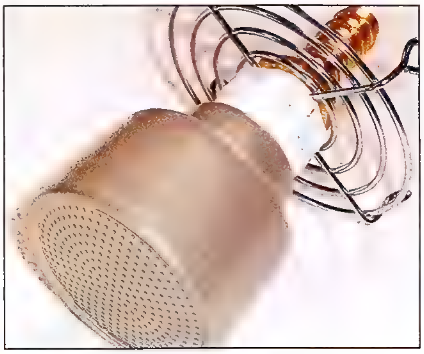
The less restriction to the flow from the pump, the higher the flow rates, and this means that a given volume of coolant will circulate through the cooling tower more times per hour. This will improve efficiency.

A finer spray of coolant will mean that the individual droplet size is smaller, giving the same amount of liquid a much larger surface area to react with the airflow, further adding to the cooling effect. Combine these two attributes and the cooling system should deliver temperatures three to four degrees below ambient at the outlet.

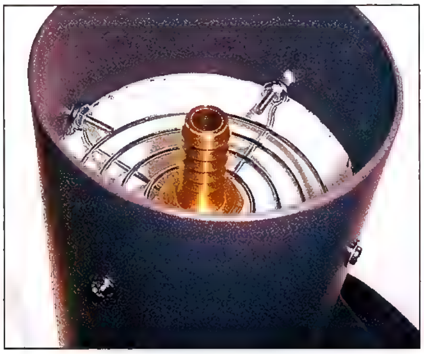


20 Mounting the spray head is relatively simple. Take an 80mm fan grill, and cut out the centre so that the connector thread will pass through, but not the nut. Bend the screw eyelets up at 90°.

21 Use Teflon tape on all of the screw connections, not just the metal/metal ones. On plastic/metal joints the tape will help the fittings screw together more easily, and the tape will eliminate any water spray out along the threads.

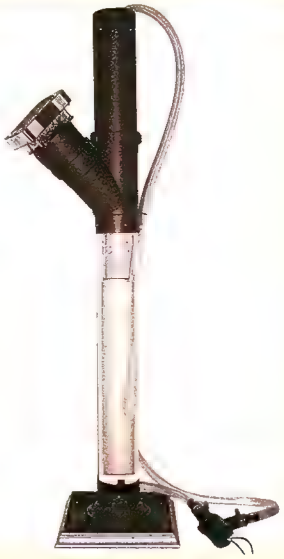


22 Assemble the spray head and barbed fitting with the modified fan grill in the centre. The grill needs to be securely 'sandwiched' between the two fittings so that the spray head won't twist to one side once the delivery hose is attached.



23 Slide the spray head down into the upper chamber approximately 40mm, and drill four 3mm holes that line up with the fan guard eyelets. Adjust the spray head so that the coolant passes down through the centre – not off to the sides.

Conclusion



Plumb the inlet and outlet hoses into your cooling system, fill the reservoir and check the set-up for any leaks. The clear tube of the reservoir will make monitoring the coolant level a 'no-brainer'. A 12V 1-amp power-pack will be sufficient to power the 120mm fan. After all this is done, you'll be ready to start the sucker up.

However, there are a few issues worth pointing out regarding evaporative cooling, and they should be considered when deciding on whether it is really the best solution for your system.

First, you will need a pump that can deliver good flow rates up to the height of the top of the tower. Look for a pump that will deliver at least 500 litres per hour at 1.2 metres 'head' – quality pumps will list this value in their specifications.

Second, remember that the tower will need to be replenished with coolant regularly – a coolant loss of approximately four litres a day on a 200W system in warm (24°C) weather seems to be an acceptable benchmark. This will mean that a reservoir of this size will nearly empty itself in a 24-hour period. So keep an eye on it.

Another point worth considering is 'drift', which is what occurs when tiny water droplets are carried out of the cooling tower with the exhaust air. Drift droplets will quickly settle around the cooling tower, with a similar appearance to condensation. The drift rate can be eliminated / reduced by employing baffle-like devices, called drift eliminators, through which the air must travel before being exhausted into the atmosphere. If your PC is too close to the cooling tower it will probably get a little damp!

The final thing that might be of concern is noise. Sound generated by falling water and the cooling fan means that this is not a 'quiet PC' solution – and you might find that it makes you want to wee a lot, or block your ears with parsley!

So, although this cooling solution might not suit everyone, there is no denying that it gives a hardcore competitive edge to those people pursuing a water-cooling system that supports serious overclocking. Especially if there is a Peltier (TEC) adding heat into the cooling system.

Free⁴

You can only enter once per competition or you'll be disqualified. You must provide a postal address and phone number for prize delivery when you enter (not a PO Box).

64MB Conductorfield Fingerprint flash drive

Solid state is the storage medium of the future – forget magnets, volatile RAM or your bathtub! It's hard to top the already dynamic duo of flexibility and portability, but Geciman (www.geciman.com), being the leading specialists in not only cool, nifty stuff, but also in putting things on top of other things, has plopped on security as well! The result: the awesome 64MB Conductorfield Fingerprint flash drive, of which we have one to give away! Thanks to those impressively impressive folks at Geciman for this great prize.

Q What is the earliest known use of biometrics?

2x Sunwave SRC-3000 touchscreen remote controls

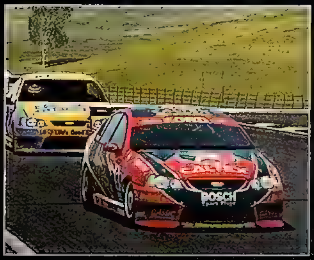
Yum. Remoteness. Not psychological remoteness mind you – as pleasant as it can be at times – we're rubbing our bellies at the concept of remote controlling, via remote control. But forget those hard, unyielding plastic contraptions 'bundled' with your VCR or TV, no, we're talking fully-configurable touchscreen remotes, that just tingle at your gentle caress. We have two quivering Sunwave SRC-3000 touchscreen remotes to give away, courtesy of Ben at Altronics (www.altronics.com.au).

Q What range is the infra-red frequency?

3x Aiwa UZ-PS128 headphones

What could be better than a portable MP3 player with a pair of nifty headphones? How about an MP3 player *built-in to* your headphones! And not just any old player or headphones, but big bass beefy headphones with 128MB of onboard MP3 playing goodness, all transferred to memory through the magic of USB. They scream sonic sensualness, and sound fantastic to boot. Ta to Aiwa (www.au.aiwa.com) for the three we have to give away this month.

Q What's the sonic range of a dog whistle?



10x copies of V8 Supercars 2 for Xbox

Vroom! Screech! Kablooey! Sounds delightful? To the trained ear, of course – but to the delicate lobes of the innocent, these are terrifying, loud and scary sounds. Well, bad luck for them, as this is exactly the sort of cacophonic craziness you can expect from a roaring game of V8 Supercars 2, as you race, brace and face the toughest competition the world has to offer. Lovely Atari has given us 10 copies for the Xbox to pass along to you, and we want to pass them along. So enter the competition!

Q What did Jim Richards call the fans after winning Bathurst in a Nissan?

EMAIL ENTRIES TO WIN@ATOMICMPC.COM.AU OR POST THEM TO: ATOMIC, PO BOX 2286, STRAWBERRY HILLS NSW 2012. PLEASE SEND A SEPARATE ENTRY FOR EACH COMPETITION. PLEASE ENSURE THE COMPETITION NAME IS THE SUBJECT OF THE EMAIL, OR IS DISPLAYED CLEARLY ON THE FRONT OF THE ENVELOPE. THE CLOSING DATE FOR ENTRIES IS 21 JULY 2004. WINNERS WILL BE ANNOUNCED IN *ATOMIC 44*.

Atomic 40 winners: Creative DC-CAM 3200Z Q. What is the answer to the riddle on page 69 that runs along the edge of the page? A. Nothing. I. Hawkins, Toowong, Qld. 2 x 256MB GBA Flash2Advance Q. What is the solution to the riddle on page 34? A. Halfway. D. Barrett, Christchurch, NZ. E. Araniego, Hoxton Park, NSW. 5 x DVD Copies of Far Cry Q. What is the correct response to the riddle on page 60? A M T Zerner, Eudunda, SA. A. Harman, Sale, Vic. M. White, Waikerie, SA. P. Johnston, North Balgowlah, NSW. M. Mulliss, Warwick, Qld.

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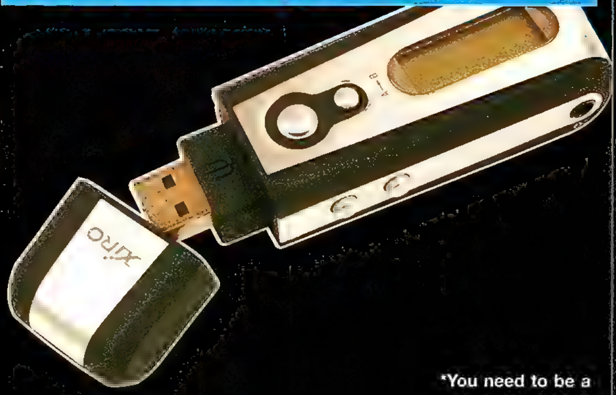

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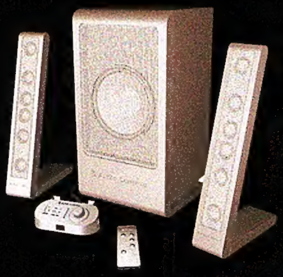

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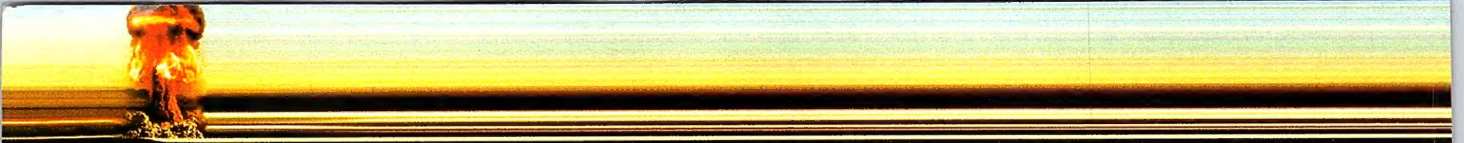


The time of the g33k is at hand

Maurice 'moz' Ford sees an opportunity at the end of his fingertips.

Society today has evolved into a bustling beehive of activity. Work commitments are now so onerous that spending time with family, once taken for granted, is almost a thing of the distant past.

The other aspect that this new work-orientated world has put paid to is socialising with friends. This situation, although less than favourable for the general populace, is a social nirvana for your average computer geek. Confused? Bear with me here … this could take a while …

Most geeks I know are shy, reserved creatures who quail at the thought of social intercourse with any other than their close geek friends. I am no different.

How do we keep in contact when we are suffering from acute social anxiety?

Technology to the rescue.

As self-respecting geeks, we embrace technology and anything that makes our lives easier. And there can be no greater single contribution to our social lives than the internet. Email, instant messenger apps and IRC are our ways of getting together and partying with our mates. It's cheap, there is no need to dress up, no unnecessary physical contact, no nasal assault from inadequate cut-price deodorant and no waiting in line to use the toilet. Bliss.

I am as guilty of this antisocial cop-out as anyone. I have lived in several households where every resident was a geek and most conversations were carried out on our computers, including arguments over whose turn it was to do the dishes.

In fact, I can go as far to say that I have never met one of my best friends. We chat every night on MSN but we have never even spoken on the phone. No doubt one day we'll catch up at an *Atomic* LAN. I can't help wonder what will happen …

I'm guessing that we will shake hands, exchange a few stilted pleasantries, attempt to start a painfully pointless conversation and then stand around feeling foolish and uncomfortable. Salvation will come when we set up our PCs beside each other and log in to MSN. With a great sigh of relief, we'll begin to chat away merrily without uttering a sound – except for the occasional laugh to give a 'lol' some credence. We will be secure in the knowledge that we have maintained our geek status and confirmed once and for all that 'real' conversation is *so* overrated.

But what of 'normal' people? How are they to cope with this new world?

Some relief can be found in the ever-evolving mobile phone, with the younger generations embracing SMS messaging with a budget-destroying fervour. SMS messaging may be a great way to keep in touch and conduct illicit love affairs, but it doesn't help us *meet* new people.

Enter the new craze of the millennium – online dating.

A few short years ago, if you met and fell for your partner via the internet, you were looked upon in a manner usually reserved for people who use integrated graphics or eat health food at LANs.

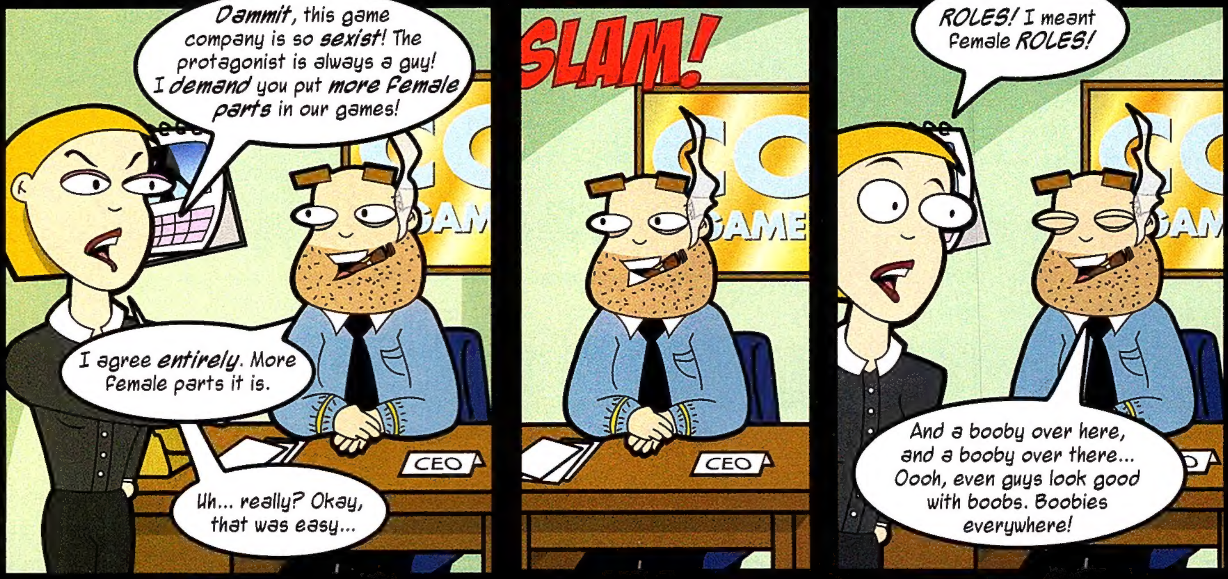
These days it's not so much of a rarity. Those who have had their 'real' lives forcibly taken from them are flocking to the internet in droves. Online dating agencies are springing up everywhere and the popularity of IMs and IRC is at an all-time high. Our heretofore secluded digital world is about to become a very crowded place.

I can see it now … Online discos, MSN parties and *Desperate and Dateless* balls on IRC. The end of our reclusive lifestyle.

Upset? Don't be. I've saved the best for last. Do you know the single biggest factor in 'scoring' with the opposite sex? Self-confidence. Now think about this – When it comes to online communications, who could be more confident than your average geek?

I have seen the future and this is how it begins. Geeks have hit the mother lode!

crashtest #15 - The Origins of Lara Croft


Dammit, this game company is so sexist! The protagonist is always a guy! I demand you put more female parts in our games!
I agree entirely. More female parts it is.
Uh... really? Okay, that was easy...
CEO
SLAM!
CEO
ROLES! I meant female ROLES!
And a booby over here, and a booby over there... Oooh, even guys look good with boobs. Boobies everywhere!

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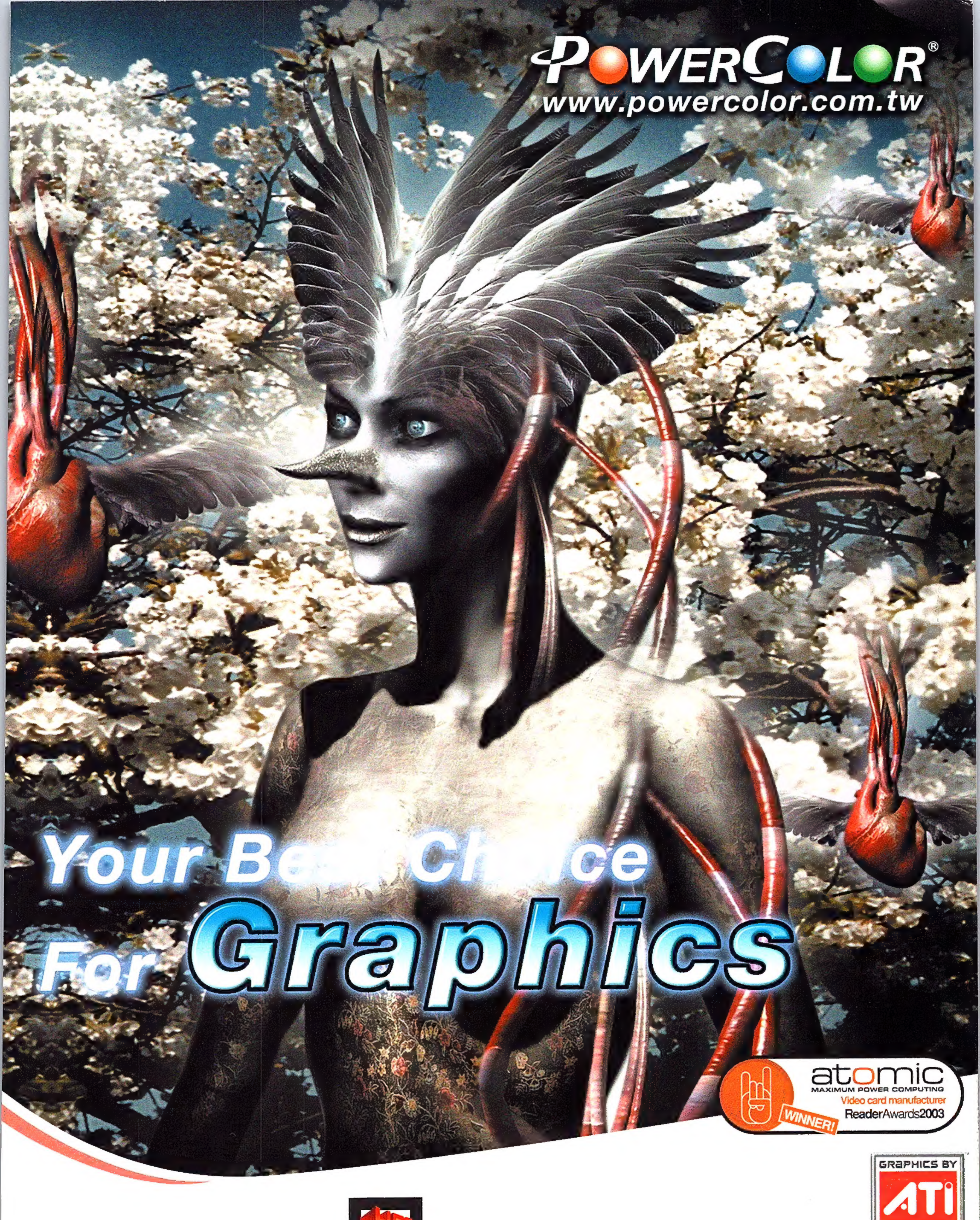

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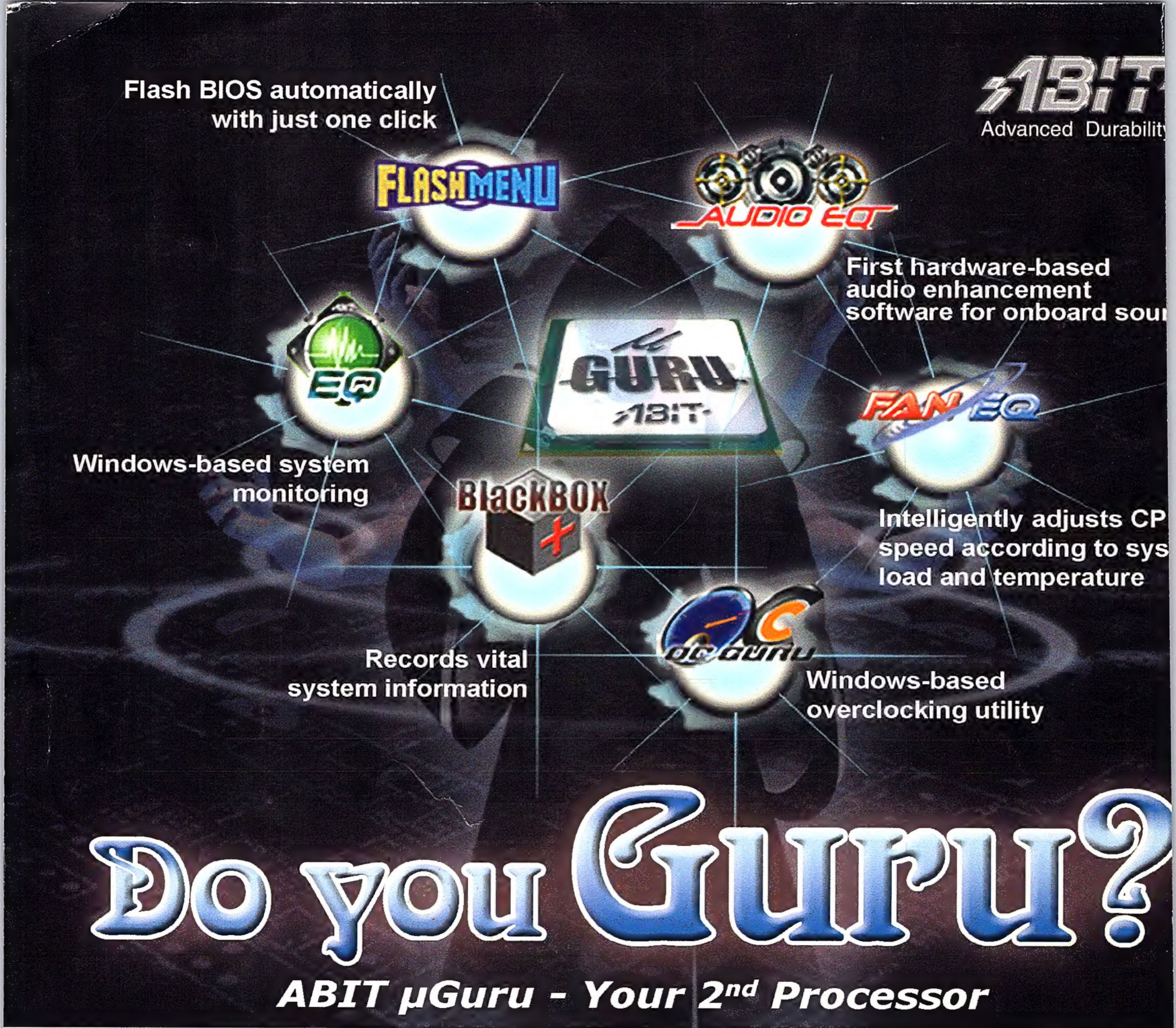

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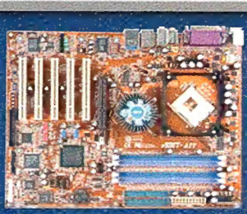

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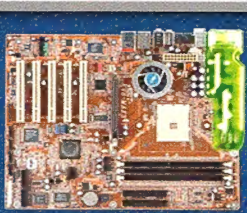

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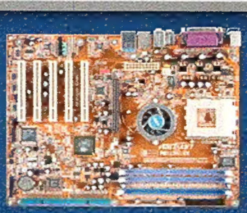

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